2021-2023 CIP TRIENNIAL PLAN

MINNESOTA ELECTRIC AND NATURAL GAS
CONSERVATION IMPROVEMENT PROGRAM
DOCKET NO. E,G002/CIP-20-473

Xcel Energy®

COMPLIANCE FILING UPDATE
JAN. 22, 2021

414 Nicollet Mall
Minneapolis, MN 55401

January 22, 2021

—Via Electronic Filing—

Dr. Aditya Ranade
Deputy Commissioner
Minnesota Department of Commerce
Division of Energy Resources
85 7th Place East, Suite 500
Saint Paul, MN 55101-2198

RE: 2021-2023 MINNESOTA ELECTRIC AND NATURAL GAS CONSERVATION IMPROVEMENT PROGRAM DOCKET NO. G002/CIP-20-473 & CIP SPECIAL SERVICE LIST

Dear Deputy Commissioner Ranade:

Northern States Power Company, doing business as Xcel Energy, respectfully submits to the Minnesota Department of Commerce, Division of Energy Resources this filing in compliance with the Deputy Commissioner's November 25 Decision regarding the 2021-2023 Triennial Plan for its Minnesota Electric and Natural Gas Conservation Improvement Program. With this filing we provide a clean version of the 2021-2023 Triennial Plan and several redline Attachments A-J that show all changes and corrections of known errors discovered during the regulatory review proceeding.

We have electronically filed this document through the eDockets system maintained by the Minnesota Department of Commerce and the Minnesota Public Utilities Commission. By copy of this transmittal letter, Xcel Energy is notifying persons on the attached service list of this filing.

Parties wishing to access our 2021-2023 CIP Triennial Plan can retrieve the document by going to the eDockets homepage and searching for Docket No. E,G002/CIP-20-473. We provide a direct link to the eDockets website: https://www.edockets.state.mn.us/EFiling/home.jsp.

Please contact me at shawn.m.white@xcelenergy.com or 612-330-6096 if you have any questions regarding this response.

Sincerely,

/s/

SHAWN WHITE
MANAGER
DSM REGULATORY STRATEGY & PLANNING

Enclosures
c: Service Lists

CERTIFICATE OF SERVICE

I, Crystal Syvertsen, hereby certify that I have this day served copies of the foregoing document on the attached list of persons.

xx by depositing a true and correct copy thereof, properly enveloped with postage paid in the United States mail at Minneapolis, Minnesota; or

xx by electronic filing.

Docket No.: E,G002/CIP-20-473 & CIP Special Service List

Dated this 22nd day of January 2021.

/s/

_____

Crystal Syvertsen
Regulatory Administrator

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EXECUTIVE SUMMARY

Northern States Power Company, doing business as Xcel Energy ("Company"), submits to the Minnesota Department of Commerce, Division of Energy Resources ("Department") our 2021-2023 Conservation Improvement Program ("CIP") Triennial Plan. This Plan aims to achieve six main objectives:

1. Meet all statutory and regulatory requirements pursuant to Minn. Stat. § 216B.2401, 216B.241 and 216B.2411 as well as Minn. R.7690.0500 and past Department decisions;
2. Align with the demand-side management (DSM) commitments made by the Company in the initial and Supplement Preferred Plan of our most recent Integrated Resource Plan filing;
3. Expand our CIP natural gas portfolio to include more ambitious savings targets than in previous plans as part of a larger strategy to help customers reduce CO2 emissions from the natural gas they use in their homes and businesses;
4. Expand and evolve program delivery approaches of previously approved products that meet both statutory CIP requirements and Demand Response targets ordered by the Minnesota Public Utilities Commission ("Commission");
5. Stem the erosion of lower net benefits generated by our programs by implementing new program delivery strategies and offering new, innovative products to our customers; and
6. Evaluate programs and increase investments in our low-income program portfolio to reaffirm our commitment to serving the needs of our under-resourced customers and traditionally underserved communities.

To achieve each of these Plan objectives, the Company is proposing our most ambitious annual electric and natural gas savings goals ever filed: 2.5 percent of retail sales for our electric portfolio and 1.3 percent for our natural gas portfolio. Those percentage goals translate to more than 700 GWh in electric savings and one million Dth in natural gas savings each program year.

The Company is striving to meet multiple statutory, regulatory and policy objectives while setting record energy savings targets; however, there are still several challenges that informed the development of this Plan. As the Company has noted in various dockets and meetings, the DSM landscape has continued to change in Minnesota due to falling avoided costs, the push for more stringent codes and standards, and, most recently, the economic downturn brought by the COVID-19 pandemic. We discuss each of these factors in greater detail below.

Plan Considerations

Declining Net Benefits Due to Falling Avoided Costs

As with the Company's 2017-2019 CIP Triennial Plan and the 2020 CIP Extension Plan, the net benefits generated by our CIP programs continue to decline, meaning that the value offered by our CIP programs has decreased. This fact can be primarily attributed to the decline in avoided costs, including T&D capacity and marginal energy costs. T&D capacity costs have dropped significantly as the Department adopted the values included in the 2017 T&D Cost Study. Marginal energy costs have also decreased as the Company is increasingly avoiding cheaper wind resources. Natural gas prices continue to decline as well.

The Pursuit of More Stringent Codes and Standards

Communities across Minnesota continue to pursue and encourage the adoption of more stringent codes and standards, especially with new building construction and renovations. Furthermore, the savings directly attributable to utility DSM programs has continued to decline due to market saturation of various energy efficiency technologies. To better serve our customers and take a leadership role in helping facilitate new code compliance, the Company is proposing to support communities by improving code compliance when new energy performance codes are implemented as part of our Business New Construction program.

The Economic Impact of COVID-19

As the long-term impact of the COVID-19 pandemic on Minnesota's economy and energy consumption are not yet completely clear, the Company did not make any specific adjustments to the annual energy savings goals or budgets proposed in this Plan. However, the Company fully anticipates the need to adjust this Plan as the impacts become clearer and we receive further guidance from the Commission on COVID-19 economic relief and recovery efforts. As one potential solution, we proposed in our recent Relief and Recovery filing (Docket No. E,G999/CI-20-492) to significantly increase spending on our low-income programs as part of COVID-19 economic relief and recovery efforts during this Plan. Details of this proposal are being developed and will be filed for the Department's review and consideration at a later date.

Because of the need to adapt to shifting conditions, we request that the Department continue to allow utilities the ability to modify CIP portfolios through both modification filings and courtesy notifications for changes in program policies, program structure and rebate structure. However, the Company does respectfully request two changes to the existing modification and courtesy notification process, which are intended to help us serve our customers in a timelier manner.

1. We request the ability to implement proposed changes upon the filing of a modification request. Under this new proposed process, utilities can implement proposed changes if the filing can be considered complete (similar to a Notice of Completion) and while its merits are being considered by the Department. If the Department's review ultimately finds a proposed change is not permissible under Minn. Stat. § 216B.241, the utility would be required to undo the change and any energy savings achieved by the proposed change during the review time would not be allowable. This new process will give utilities the ability to make necessary adjustments more quickly and achieve greater energy savings. This flexibility would not pertain to new program proposals, which typically require more significant review and a 90-day timeline.
2. The Company requests that all temporary program adjustments made specifically in response to pandemic conditions be limited to a courtesy notification. Our intent with this proposal is to have the flexibility needed to quickly shift to virtual program activities should public health conditions necessitate such a change.

New Programmatic Approaches

To address the aforementioned challenges and continue to innovate our CIP portfolio, the Company has made numerous programmatic adjustments. Details on specific program changes are called out in the "Program Changes" section of each program description.

Historical Achievements

This Plan continues the Company's long-standing commitment to DSM. Although DSM activities in many states around the country have ebbed and flowed, Minnesota and Xcel Energy, as its largest electric utility, have generally maintained a consistent and high level of commitment to DSM. This long-standing commitment and dedication to excellence in running cost-effective conservation and load management programs places the Company among the nation's top utilities in terms of energy and demand saved and most innovative programs.

Between 1990 and 2019, the Company invested nearly $1.9 billion (nominal) resulting in 10,344 GWh of electric energy savings, 3,720 MW of electric demand savings and an estimated 17,442,603 MCF of natural gas savings. As indicated by Figures 1 and 2, our electric CIP portfolio has surpassed the statewide target of 1.5 percent every year since 2011, with a peak of electricity savings that topped 2.3 percent in 2018. Figures 1 and 2 show our historical spending on CIP and energy savings achievements, through 2019 and the approved 2020 goals. Our proposed goals for 2021, 2022, and 2023 are also provided to put the new Plan in clear context.

Figure 1: CIP Electric Achievements, 2005-2023

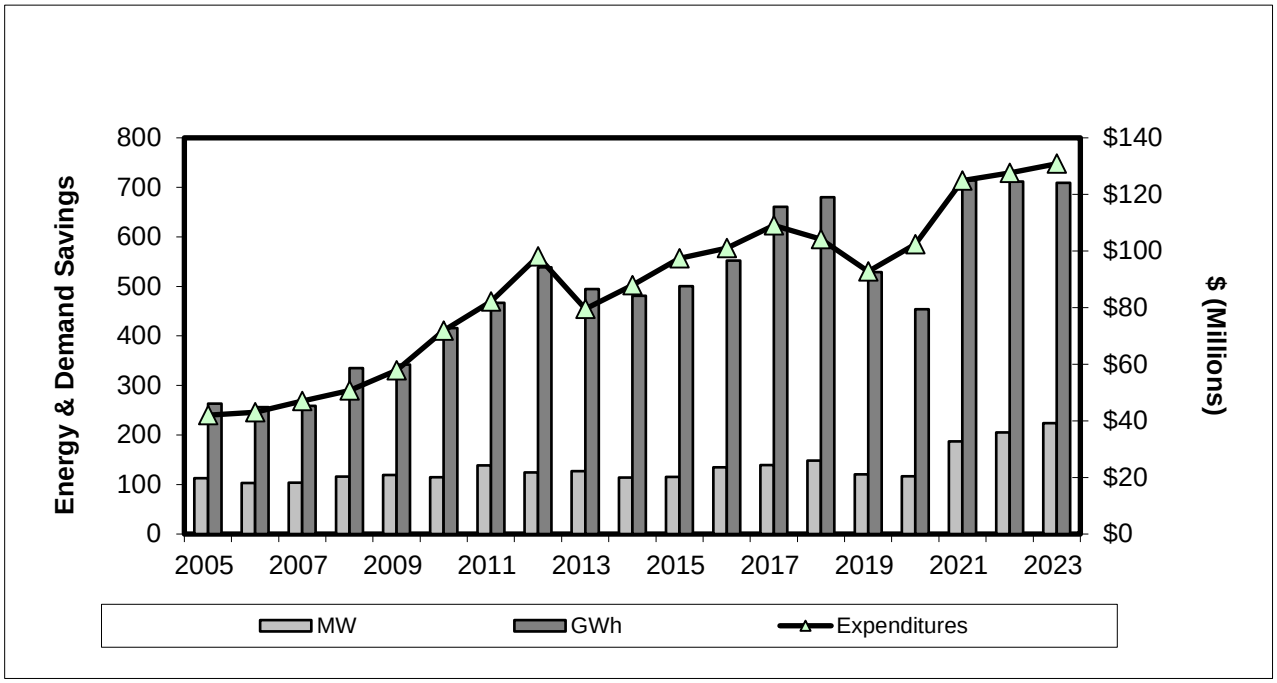
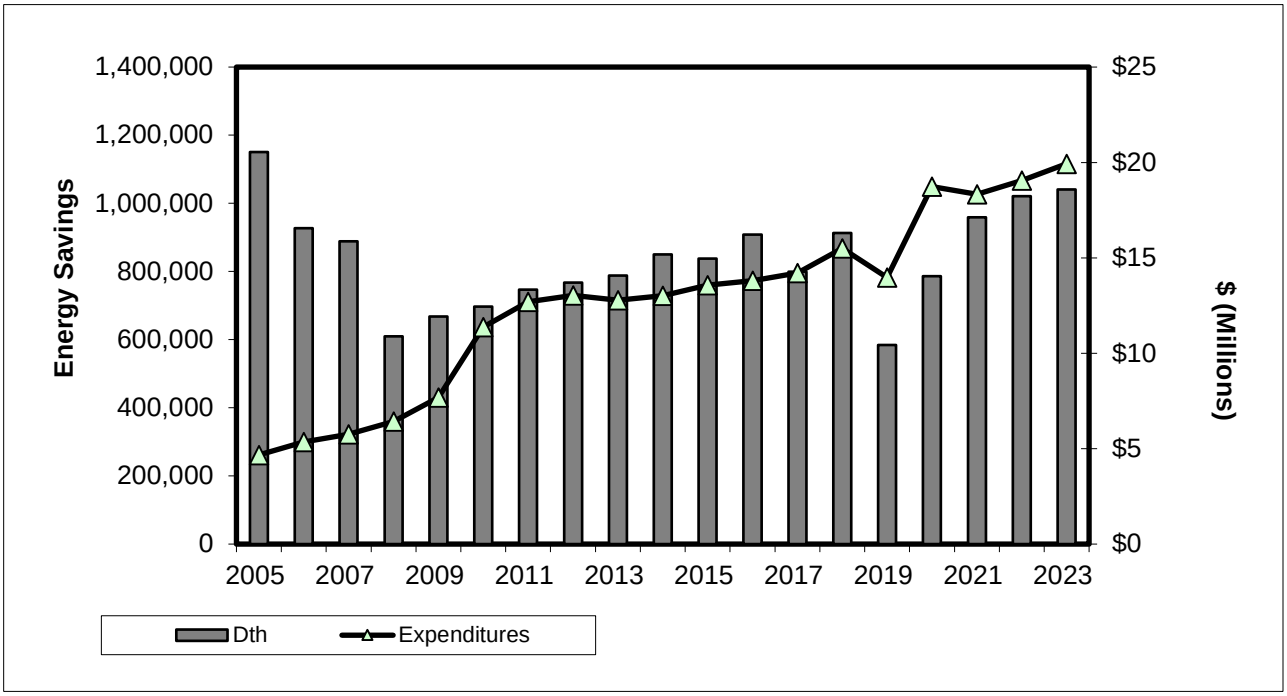


Figure 2: CIP Gas Achievements, 2005-2023



Proposed Goals

In this Plan, we continue our legacy of providing customers with a wide variety of options for saving energy. In sum, this Plan proposes ambitious goals of saving 2,135 GWh, 616 MW, and 3,020,710 Dth over the three-year period and at a cost of $442 million. The proposed electric savings goals align with Company's DSM commitments in the initial and Supplement Preferred Plan (currently under consideration in Docket No. E002/RP-19-368). The proposed natural gas savings goals reflect progress on one important piece of an overall company strategy to help customers reduce their natural gas use and carbon dioxide emissions. Table 1 overviews our proposed goals and budgets for each program and segment by year. The Plan also includes estimated budgets and energy savings from anticipated alternative filings.

Table 1: Goals and Budgets as a Percent of Retail Sales

	Electric				Gas			
Year	**Budget**	**Proposed Energy Savings (MWh)**	**Total Adjusted Sales (MWh)**	**Savings as % of Retail Sales**	**Budget**	**Proposed Energy Savings (Dth)**	**Total Adjusted Sales (Dth)**	**Savings as % of Retail Sales**
2021	$124,877,557	714,026	27,845,860	2.56%	$18,335,329	958,689	77,527,254	1.24%
2022	$127,594,440	711,518	27,845,860	2.56%	$19,050,095	1,021,119	77,527,254	1.32%
2023	$130,842,413	709,063	27,845,860	2.55%	$19,933,473	1,040,902	77,527,254	1.34%

The Company respectfully requests that the Department approve the goals and budgets included in this Plan by Segment to help guide our electric and natural gas CIP activities for the 2021, 2022, and 2023 program years. This is consistent with the Department's policy to maintain portfolio cost-effectiveness at the Segment, rather than the program-level. This approach will also allow us greater flexibility to manage specific product performance within each segment as well as the overall cost-effectiveness of this Plan. We provide the segment-level goals for each program year in Tables 2, 3 and 4. Tables 5, 6 and 7 provide a detailed breakdown of program-level goals for each program year.

Table 2: 2021 Segment-Level Goals

	Electric				Gas		
Segment	**Participation**	**Budget**	**Gen kW**	**Gen kWh**	**Participation**	**Budget**	**Dth**
Business	105,607	$54,168,651	108,712	418,426,313	5,406	$5,046,601	536,578
Residential	1,593,364	$28,190,267	62,895	213,826,635	616,392	$7,957,269	402,608
Low-Income	5,410	$2,847,592	708	1,737,820	1,012	$1,794,107	11,753
Planning		$11,425,187				$2,582,474	
Research, Evaluations & Pilots		$6,455,634				$421,107	
Assessments		$1,974,981				$345,600	
Alternative	5,942	$19,815,245	14,767	80,035,589	2,755	$188,172	7,750
Total	1,710,323	$124,877,557	187,082	714,026,357	625,565	$18,335,329	958,689

Table 3: 2022 Segment-Level Goals

	Electric				Gas		
Segment	**Participation**	**Budget**	**Gen kW**	**Gen kWh**	**Participation**	**Budget**	**Dth**
Business	102,957	$55,461,862	125,562	417,362,227	5,666	$5,319,945	579,017
Residential	1,560,994	$28,928,943	64,099	212,256,325	617,384	$8,223,607	421,419
Low-Income	5,229	$2,948,593	850	1,863,863	1,131	$1,865,253	12,933
Planning		$11,912,594				$2,675,452	
Research, Evaluations & Pilots		$6,516,523				$429,965	
Assessments		$1,974,981				$345,600	
Alternative	5,942	$19,850,943	14,767	80,035,589	2,755	$190,273	7,750
Total	1,675,122	$127,594,440	205,279	711,518,004	626,936	$19,050,095	1,021,119

Table 4: 2023 Segment-Level Goals

	Electric				Gas		
Segment	**Participation**	**Budget**	**Gen kW**	**Gen kWh**	**Participation**	**Budget**	**Dth**
Business	102,457	$56,849,023	142,680	419,326,539	5,875	$5,522,055	581,420
Residential	1,545,554	$29,438,210	65,112	207,691,151	615,460	$8,555,887	438,045
Low-Income	5,789	$3,084,572	1,021	2,009,241	1,103	$1,922,225	13,686
Planning		$12,568,132				$2,893,701	
Research, Evaluations & Pilots		$7,037,858				$501,621	
Assessments		$1,974,981				$345,600	
Alternative	5,942	$19,889,637	14,767	80,035,589	2,755	$192,384	7,750
Total	1,659,742	$130,842,413	223,579	709,062,519	625,193	$19,933,473	1,040,902

Table 5: Executive Summary Table – 2021

Regulatory Name	Electric Participants	Electric Budget	DR Gen kW	EE Gen kW	Generator kWh	Electric Utility	Electric Societal	Gas Participants	Gas Budget	Dth Savings	Gas Utility	Gas Societal
Business Energy Assessments	126	$1,371,620	0	540	6,084,451	1.27	1.08	8	$204,614	3,738	1.34	2.61
Business New Construction	250	$10,977,919	28	13,199	56,517,902	3.23	1.45	87	$903,282	85,531	7.65	1.63
Commercial Efficiency	533	$4,444,182	1,422	5,379	48,147,052	4.70	1.76	71	$340,789	43,150	9.54	4.09
Commercial Streamlined Assessment	320	$1,926,974	7	2,731	14,747,729	4.31	1.73	40	$132,169	8,278	4.59	3.94
Compressed Air Efficiency	246	$1,238,138	151	1,398	10,109,742	2.75	1.75	0	$0	0	N/A	0.00
Custom Efficiency	30	$976,481	0	681	4,852,951	2.41	4.28	7	$144,916	15,389	8.22	6.36
Data Center Efficiency	42	$426,330	0	295	5,867,570	5.44	1.55	0	$0	0	N/A	0.00
Efficiency Controls	68	$793,843	286	155	11,527,577	4.00	1.53	13	$61,385	10,414	10.50	1.99
Energy Information Systems	24	$551,841	0	260	3,457,366	0.84	1.13	3	$66,915	10,688	4.73	1.26
Electric Rate Savings	36	$553,794	6,433	0	12,688	3.32	3.47	0	$0	0	N/A	0.00
Foodservice Equipment	63	$50,522	3	80	548,006	5.12	3.17	122	$98,539	9,661	5.51	2.53
HVAC+R	2,415	$3,587,677	77	5,027	28,005,526	3.75	2.32	1,023	$1,329,455	100,846	3.94	2.77
Lighting	16,839	$14,027,886	0	23,003	151,863,680	4.6	1.63	0	$0	0	N/A	0.00
Multi-Family Building Efficiency	7,208	$1,611,500	70	609	3,965,236	1.06	1.11	2,402	$612,980	19,119	1.40	3.18
Peak Partner Rewards	30	$1,490,495	28,887	0	170,712	1.18	1.75	0	$0	0	N/A	0.00
Process Efficiency	360	$6,839,616	700	12,477	72,149,924	5.17	3.84	47	$1,067,126	229,125	10.97	4.18
Commercial AC Control	4,017	$2,942,808	4,815	0	398,201	0.88	1.00	83	$30,386	639	0.88	1.36
Self-Direct	0	$5,000	0	0	0	N/A	0.00	0	$1,870	0	N/A	0.00
Business Segment EE and DR Total	**32,607**	**$53,816,628**	**42,879**	**65,832**	**418,426,313**	**3.72**	**2.11**	**3,906**	**$4,994,426**	**536,578**	**6.32**	**2.88**
Energy Benchmarking	0	$108,700	0	0	0	N/A	0.00	0	$27,175	0	N/A	0.00
Business Education	13,000	$197,000	0	0	0	N/A	0.00	1,500	$25,000	0	N/A	0.00
Small Business Lamp Recycling	60,000	$46,323	0	0	0	N/A	0.00	0	$0	0	N/A	0.00
Business Segment with Indirect Participants	**105,607**	**$54,168,651**	**42,879**	**65,832**	**418,426,313**	**3.69**	**2.11**	**5,406**	**$5,046,601**	**536,578**	**6.25**	**2.87**
Efficient New Homes Construction	5,585	$956,677	0	1,760	4,161,950	3.41	1.54	3,390	$1,564,889	45,339	2.28	1.13
Energy Efficient Showerhead	5,840	$33,516	0	66	810,168	6.13	37.42	49,400	$259,585	26,781	4.32	38.71
Home Energy Insights	232,000	$1,428,667	0	4,409	19,949,994	1.53	1.32	131,000	$170,293	43,372	2.22	3.31
Home Energy Squad	8,133	$2,016,290	675	1,342	7,807,673	2.00	2.60	2,988	$674,940	18,458	1.14	6.49
Home Lighting	231,508	$5,764,817	0	22,180	161,583,086	11.27	7.62	0	$0	0	N/A	0.00
Insulation Rebate Program	1,381	$90,015	25	231	221,301	2.96	0.98	996	$247,590	19,689	4.41	1.16
Refrigerator Recycling	6,900	$1,118,032	83	849	6,369,241	1.16	1.73	0	$0	0	N/A	0.00
Residential Demand Response	31,465	$9,069,158	20,243	1,000	520,236	1.33	1.51	14,650	$313,822	29,999	4.01	4.14
Residential Heating and Cooling	18,640	$4,797,447	123	7,908	7,655,703	2.24	1.25	19,670	$3,176,249	139,188	3.27	1.59
School Education Kits	31,500	$1,025,652	0	1,962	4,650,469	2.52	3.80	16,500	$363,115	76,861	8.82	31.41
Whole Home Efficiency	212	$39,258	7	35	96,815	1.48	1.00	198	$116,436	2,922	1.68	1.08
Residential Segment EE and DR Total	**573,164**	**$26,339,530**	**21,154**	**41,740**	**213,826,635**	**3.86**	**3.21**	**238,792**	**$6,886,920**	**402,608**	**3.19**	**2.75**
Consumer Education	477,000	$783,000	0	0	0	N/A	0.00	375,000	$522,000	0	N/A	0.00
Home Energy Audit	3,200	$661,942	0	0	0	N/A	0.00	2,600	$548,349	0	N/A	0.00
Residential Lamp Recycling	540,000	$405,795	0	0	0	N/A	0.00	0	$0	0	N/A	0.00
Residential Segment with Indirect Participants	**1,593,364**	**$28,190,267**	**21,154**	**41,740**	**213,826,635**	**3.61**	**3.08**	**616,392**	**$7,957,269**	**402,608**	**2.76**	**2.64**
Home Energy Savings Program	1,900	$1,364,167	37	111	562,831	0.22	0.59	340	$1,478,514	6,404	0.26	0.79
Low Income Home Energy Squad	1,594	$590,011	258	229	970,345	0.96	1.61	672	$315,592	5,349	0.71	4.23
Multi-Family Energy Savings Program	1,916	$893,415	0	74	204,645	0.12	0.55	0	$0	0	N/A	0.00
Low Income Segment Total	**5,410**	**$2,847,592**	**294**	**414**	**1,737,820**	**0.34**	**0.73**	**1,012**	**$1,794,107**	**11,753**	**0.34**	**1.16**
Advertising & Promotion	0	$6,244,922	0	0	0	N/A	0.00	0	$1,545,479	0	N/A	0.00
Application Development & Maintenance	0	$3,491,894	0	0	0	N/A	0.00	0	$571,350	0	N/A	0.00
CIP Training	0	$291,121	0	0	0	N/A	0.00	0	$91,996	0	N/A	0.00
Partners in Energy	0	$873,655	0	0	0	N/A	0.00	0	$227,577	0	N/A	0.00
Regulatory Affairs	0	$523,595	0	0	0	N/A	0.00	0	$146,071	0	N/A	0.00
Planning Segment Total	**0**	**$11,425,187**	**0**	**0**	**0**	**N/A**	**0.00**	**0**	**$2,582,474**	**0**	**N/A**	**0.00**
Codes and Standards	0	$20,000	0	0	0	N/A	0.00	0	$5,000	0	N/A	0.00
Market Research	0	$1,286,628	0	0	0	N/A	0.00	0	$274,002	0	N/A	0.00
Product Development	0	$5,149,006	0	0	0	N/A	0.00	0	$142,105	0	N/A	0.00
Research, Evaluations, & Pilots Segment Total	**0**	**$6,455,634**	**0**	**0**	**0**	**N/A**	**0.00**	**0**	**$421,107**	**0**	**N/A**	**0.00**
Portfolio Total	**1,704,381**	**$103,087,331**	**64,328**	**107,987**	**633,990,768**	**2.94**	**2.12**	**622,810**	**$17,801,557**	**950,939**	**3.04**	**2.50**
Enerchange	0	$418,500	0	0	0	N/A	0.00	0	$46,500	0	N/A	0.00
Energy Smart	3,200	$437,230	0	0	0	N/A	0.00	2,600	$20,727	0	N/A	0.00
One-Stop Shop	2,742	$18,789,160	0	14,767	80,035,589	1.97	1.38	155	$100,915	7,750	3.37	5.87
Trillion Btu	0	$170,355	0	0	0	N/A	0.00	0	$20,030	0	N/A	0.00
Anticipated Alternative Filings Total	**5,942**	**$19,815,245**	**0**	**14,767**	**80,035,589**			**2,755**	**$188,172**	**7,750**		
Assessments	0	$1,974,981	0	0	0	N/A	0.00	0	$345,600	0	N/A	0.00
Electric Utility Infrastructure	0	$0	0	0	0	N/A	N/A	0	$0	0	N/A	0.00
Portfolio Total w Alternative Filings	**1,710,323**	**$124,877,557**	**64,328**	**122,754**	**714,026,357**			**625,410**	**$18,335,329**	**958,689**		

Table 6: Executive Summary Table – 2022

Regulatory Name	Electric Participants	Electric Budget	DR Gen kW	EE Gen kW	Generator kWh	Electric Utility	Electric Societal	Gas Participants	Gas Budget	Dth Savings	Gas Utility	Gas Societal
Business Energy Assessments	241	$1,928,206	3	1,307	14,781,467	2.39	1.40	15	$243,216	10,667	3.34	4.22
Business New Construction	287	$10,603,395	243	13,294	54,617,918	3.37	1.51	131	$926,427	87,555	7.93	1.69
Commercial Efficiency	535	$4,472,445	1,866	5,379	48,149,679	4.91	1.85	71	$342,238	43,150	9.94	4.25
Commercial Streamlined Assessment	312	$1,836,494	8	2,490	13,315,960	4.29	1.80	39	$137,292	9,161	5.06	4.14
Compressed Air Efficiency	272	$1,346,855	302	1,532	11,074,432	2.92	1.87	0	$0	0	N/A	0.00
Custom Efficiency	30	$990,288	0	681	4,852,951	2.49	4.29	7	$145,973	15,389	8.55	6.48
Data Center Efficiency	43	$452,806	280	295	6,062,423	5.61	1.64	0	$0	0	N/A	0.00
Efficiency Controls	64	$738,433	286	145	10,795,807	4.26	1.62	15	$69,460	12,016	11.21	2.06
Energy Information Systems	24	$597,058	0	260	3,457,366	0.83	1.12	3	$161,301	37,408	7.19	1.25
Electric Rate Savings	36	$567,283	6,433	0	12,688	3.30	3.45	0	$0	0	N/A	0.00
Foodservice Equipment	69	$55,667	5	86	592,926	5.24	3.38	142	$113,449	11,672	5.96	2.69
HVAC+R	2,415	$3,699,842	77	5,027	28,005,526	3.79	2.40	1,023	$1,351,553	100,846	4.06	2.85
Lighting	15,694	$13,691,323	0	21,584	143,415,303	4.68	1.70	0	$0	0	N/A	0.00
Multi-Family Building Efficiency	7,569	$1,644,242	74	617	3,990,789	1.09	1.16	2,523	$664,109	22,886	1.61	3.32
Peak Partner Rewards	45	$1,940,051	43,331	0	256,069	1.39	2.05	0	$0	0	N/A	0.00
Process Efficiency	371	$7,129,371	1,399	12,612	73,399,890	5.26	3.89	47	$1,069,838	227,111	11.29	4.39
Commercial AC Control	4,950	$3,400,130	5,947	0	581,034	0.89	1.00	150	$37,680	1,155	1.34	1.93
Self-Direct	0	$5,150	0	0	0	N/A	0.00	0	$1,920	0	N/A	0.00
Business Segment EE and DR Total	**32,957**	**$55,099,040**	**60,254**	**65,308**	**417,362,227**	**3.78**	**2.19**	**4,166**	**$5,264,455**	**579,017**	**6.61**	**2.91**
Energy Benchmarking	0	$121,959	0	0	0	N/A	0.00	0	$30,490	0	N/A	0.00
Business Education	13,000	$197,000	0	0	0	N/A	0.00	1,500	$25,000	0	N/A	0.00
Small Business Lamp Recycling	57,000	$43,863	0	0	0	N/A	0.00	0	$0	0	N/A	0.00
Business Segment with Indirect Participants	**102,957**	**$55,461,862**	**60,254**	**65,308**	**417,362,227**	**3.75**	**2.18**	**5,666**	**$5,319,945**	**579,017**	**6.54**	**2.90**
Efficient New Homes Construction	5,759	$1,001,518	1	1,827	4,344,002	3.52	1.59	3,494	$1,610,512	47,520	2.43	1.18
Energy Efficient Showerhead	5,840	$34,625	0	66	810,168	6.21	36.91	49,400	$267,614	26,781	4.39	38.04
Home Energy Insights	230,000	$1,429,827	0	5,492	21,643,697	1.75	2.45	129,000	$170,602	45,678	2.50	3.70
Home Energy Squad	9,149	$2,272,320	950	1,546	8,818,627	2.13	2.73	3,362	$755,624	21,136	1.22	6.57
Home Lighting	224,476	$5,634,631	0	21,534	156,826,897	11.76	8.02	0	$0	0	N/A	0.00
Insulation Rebate Program	1,381	$91,546	25	231	221,301	3.00	1.02	996	$247,485	19,689	4.62	1.20
Refrigerator Recycling	6,800	$1,135,912	124	870	6,315,666	1.23	1.83	0	$0	0	N/A	0.00
Residential Demand Response	31,515	$9,413,511	20,247	1,000	528,467	1.31	1.49	14,650	$311,144	29,999	4.23	4.30
Residential Heating and Cooling	18,640	$4,837,085	123	7,908	7,655,703	2.29	1.29	19,670	$3,182,477	139,188	3.41	1.64
School Education Kits	34,000	$1,171,203	0	2,112	4,979,865	2.42	3.68	19,000	$456,741	88,264	8.43	29.50
Whole Home Efficiency	234	$43,536	7	37	111,932	1.54	1.05	212	$123,218	3,164	1.81	1.12
Residential Segment EE and DR Total	**567,794**	**$27,065,713**	**21,476**	**42,623**	**212,256,325**	**3.89**	**3.31**	**239,784**	**$7,125,418**	**421,419**	**3.35**	**2.89**
Consumer Education	477,000	$783,000	0	0	0	N/A	0.00	375,000	$522,000	0	N/A	0.00
Home Energy Audit	3,200	$696,911	0	0	0	N/A	0.00	2,600	$576,189	0	N/A	0.00
Residential Lamp Recycling	513,000	$383,319	0	0	0	N/A	0.00	0	$0	0	N/A	0.00
Residential Segment with Indirect Participants	**1,560,994**	**$28,928,943**	**21,476**	**42,623**	**212,256,325**	**3.64**	**3.19**	**617,384**	**$8,223,607**	**421,419**	**2.90**	**2.76**
Home Energy Savings Program	1,919	$1,368,179	37	111	562,832	0.23	0.60	343	$1,512,795	6,995	0.28	0.81
Low Income Home Energy Squad	1,350	$664,958	364	262	1,091,972	1.04	1.65	788	$352,458	5,938	0.74	4.29
Multi-Family Energy Savings Program	1,960	$915,456	0	76	209,060	0.12	0.55	0	$0	0	N/A	0.00
Low Income Segment Total	**5,229**	**$2,948,593**	**401**	**449**	**1,863,863**	**0.38**	**0.76**	**1,131**	**$1,865,253**	**12,933**	**0.37**	**1.22**
Advertising & Promotion	0	$6,310,688	0	0	0	N/A	0.00	0	$1,564,418	0	N/A	0.00
Application Development & Maintenance	0	$3,860,250	0	0	0	N/A	0.00	0	$625,656	0	N/A	0.00
CIP Training	0	$312,435	0	0	0	N/A	0.00	0	$103,023	0	N/A	0.00
Partners in Energy	0	$889,919	0	0	0	N/A	0.00	0	$231,901	0	N/A	0.00
Regulatory Affairs	0	$539,303	0	0	0	N/A	0.00	0	$150,454	0	N/A	0.00
Planning Segment Total	**0**	**$11,912,594**	**0**	**0**	**0**	**N/A**	**0.00**	**0**	**$2,675,452**	**0**	**N/A**	**0.00**
Codes and Standards	0	$80,000	0	0	0	N/A	0.00	0	$20,000	0	N/A	0.00
Market Research	0	$1,232,147	0	0	0	N/A	0.00	0	$263,897	0	N/A	0.00
Product Development	0	$5,204,376	0	0	0	N/A	0.00	0	$146,068	0	N/A	0.00
Research, Evaluations, & Pilots Segment Total	**0**	**$6,516,523**	**0**	**0**	**0**	**N/A**	**0.00**	**0**	**$429,965**	**0**	**N/A**	**0.00**
Portfolio Total	**1,669,180**	**$105,768,516**	**82,131**	**108,380**	**631,482,415**	**2.97**	**1.98**	**624,181**	**$18,514,222**	**1,013,369**	**3.20**	**2.58**
Enerchange	0	$418,500	0	0	0	N/A	0.00	0	$46,500	0	N/A	0.00
Energy Smart	3,200	$472,917	0	0	0	N/A	0.00	2,600	$22,828	0	N/A	0.00
One-Stop Shop	2,742	$18,789,160	0	14,767	80,035,589	2.06	1.45	155	$100,915	7,750	3.37	5.87
Trillion Btu	0	$170,366	0	0	0	N/A	0.00	0	$20,030	0	N/A	0.00
Anticipated Alternative Filings Total	**5,942**	**$19,850,943**	**0**	**14,767**	**80,035,589**			**2,755**	**$190,273**	**7,750**		
Assessments	0	$1,974,981	0	0	0	N/A	0.00	0	$345,600	0	N/A	0.00
Electric Utility Infrastructure	0	$0	0	0	0	N/A	N/A	0	$0	0	N/A	0.00
Portfolio Total w Alternative Filings	**1,675,122**	**$127,594,440**	**82,131**	**123,147**	**711,518,004**			**626,781**	**$19,050,095**	**1,021,119**		

Table 7: Executive Summary Table – 2023

Regulatory Name	Electric Participants	Electric Budget	DR Gen kW	EE Gen kW	Generator kWh	Electric Utility	Electric Societal	Gas Participants	Gas Budget	Dth Savings	Gas Utility	Gas Societal
Business Energy Assessments	323	$2,379,473	186	1,725	19,714,087	2.76	1.45	28	$287,527	10,667	2.95	4.06
Business New Construction	334	$10,396,921	322	13,194	51,449,521	3.40	1.42	177	$892,879	87,555	8.61	1.77
Commercial Efficiency	537	$4,482,140	2,311	5,307	47,819,907	5.13	1.89	71	$340,754	43,150	10.45	4.41
Commercial Streamlined Assessment	311	$1,774,181	17	2,323	12,323,207	4.35	1.84	40	$148,842	9,161	4.88	4.18
Compressed Air Efficiency	302	$1,467,044	453	1,697	12,288,838	3.17	1.94	0	$0	0	N/A	0.00
Custom Efficiency	30	$1,004,508	0	681	4,852,951	2.59	4.30	7	$147,061	15,389	8.88	6.60
Data Center Efficiency	44	$478,775	280	341	6,386,988	6.02	1.74	0	$0	0	N/A	0.00
Efficiency Controls	63	$762,302	286	143	10,612,865	4.33	1.63	18	$81,541	14,420	12.00	2.13
Energy Information Systems	24	$646,700	0	260	3,457,366	0.84	1.06	3	$164,805	37,408	7.36	1.29
Electric Rate Savings	36	$580,087	6,433	0	12,688	3.30	3.45	0	$0	0	N/A	0.00
Foodservice Equipment	74	$60,820	5	92	637,843	5.39	3.49	163	$129,904	11,672	5.45	2.71
HVAC+R	2,415	$3,774,252	77	5,027	28,005,526	3.91	2.44	1,023	$1,459,601	100,846	3.93	2.87
Lighting	15,624	$13,651,281	0	21,337	142,196,737	4.88	1.74	0	$0	0	N/A	0.00
Multi-Family Building Efficiency	7,947	$1,692,376	78	621	3,982,103	1.12	1.17	2,649	$701,958	22,886	1.59	3.29
Peak Partner Rewards	60	$2,392,782	57,774	0	341,425	1.53	2.25	0	$0	0	N/A	0.00
Process Efficiency	383	$7,287,050	1,922	12,708	74,453,491	5.47	3.92	46	$1,065,251	227,111	11.87	4.54
Commercial AC Control	5,950	$3,636,851	7,079	0	790,996	0.95	1.06	150	$40,884	1,155	1.30	1.87
Self-Direct	0	$5,304	0	0	0	N/A	0.00	0	$1,980	0	N/A	0.00
Business Segment EE and DR Total	**34,457**	**$56,472,847**	**77,224**	**65,457**	**419,326,539**	**3.88**	**2.19**	**4,375**	**$5,462,987**	**581,420**	**6.70**	**2.99**
Energy Benchmarking	0	$136,272	0	0	0	N/A	0.00	0	$34,068	0	N/A	0.00
Business Education	13,000	$197,000	0	0	0	N/A	0.00	1,500	$25,000	0	N/A	0.00
Small Business Lamp Recycling	55,000	$42,904	0	0	0	N/A	0.00	0	$0	0	N/A	0.00
Business Segment with Indirect Participants	**102,457**	**$56,849,023**	**77,224**	**65,457**	**419,326,539**	**3.85**	**2.19**	**5,875**	**$5,522,055**	**581,420**	**6.63**	**2.98**
Efficient New Homes Construction	6,001	$1,027,794	5	1,891	4,505,632	3.69	1.63	3,628	$1,665,465	49,384	2.54	1.23
Energy Efficient Showerhead	5,840	$35,736	0	66	810,168	6.32	36.04	49,400	$275,777	26,781	4.46	37.39
Home Energy Insights	235,000	$1,431,021	0	6,984	21,028,930	1.98	2.44	124,000	$170,920	45,678	2.61	3.84
Home Energy Squad	10,293	$2,562,983	1,284	1,719	9,912,207	2.25	2.80	3,782	$845,700	24,184	1.31	6.65
Home Lighting	218,166	$5,518,994	0	20,942	152,443,243	12.33	8.14	0	$0	0	N/A	0.00
Insulation Rebate Program	1,381	$90,678	25	231	221,301	3.13	1.04	996	$249,954	19,689	4.79	1.24
Refrigerator Recycling	6,700	$1,156,823	166	891	6,262,091	1.30	1.82	0	$0	0	N/A	0.00
Residential Demand Response	31,565	$9,752,225	20,250	1,000	536,699	1.29	1.46	14,650	$317,978	29,999	4.33	4.39
Residential Heating and Cooling	18,640	$4,596,189	123	7,224	6,515,438	2.28	1.37	19,670	$3,213,516	139,188	3.54	1.69
School Education Kits	36,500	$1,322,973	0	2,262	5,309,262	2.36	3.52	21,500	$557,198	99,667	8.17	28.01
Whole Home Efficiency	268	$51,964	9	41	146,180	1.62	1.09	234	$131,340	3,475	1.95	1.17
Residential Segment EE and DR Total	**570,354**	**$27,547,380**	**21,861**	**43,250**	**207,691,151**	**3.95**	**3.39**	**237,860**	**$7,427,847**	**438,045**	**3.47**	**3.02**
Consumer Education	477,000	$783,000	0	0	0	N/A	0.00	375,000	$522,000	0	N/A	0.00
Home Energy Audit	3,200	$733,487	0	0	0	N/A	0.00	2,600	$606,040	0	N/A	0.00
Residential Lamp Recycling	495,000	$374,343	0	0	0	N/A	0.00	0	$0	0	N/A	0.00
Residential Segment with Indirect Participants	**1,545,554**	**$29,438,210**	**21,861**	**43,250**	**207,691,151**	**3.69**	**3.26**	**615,460**	**$8,555,887**	**438,045**	**3.01**	**2.88**
Home Energy Savings Program	1,938	$1,372,536	39	111	562,834	0.24	0.60	347	$1,528,377	7,103	0.30	0.82
Low Income Home Energy Squad	1,793	$750,440	491	300	1,227,565	1.12	1.72	756	$393,848	6,584	0.77	4.32
Multi-Family Energy Savings Program	2,058	$961,597	0	80	218,842	0.13	0.56	0	$0	0	N/A	0.00
Low Income Segment Total	**5,789**	**$3,084,572**	**530**	**490**	**2,009,241**	**0.42**	**0.80**	**1,103**	**$1,922,225**	**13,686**	**0.39**	**1.28**
Advertising & Promotion	0	$6,389,040	0	0	0	N/A	0.00	0	$1,584,264	0	N/A	0.00
Application Development & Maintenance	0	$4,372,001	0	0	0	N/A	0.00	0	$802,781	0	N/A	0.00
CIP Training	0	$344,963	0	0	0	N/A	0.00	0	$115,277	0	N/A	0.00
Partners in Energy	0	$906,646	0	0	0	N/A	0.00	0	$236,412	0	N/A	0.00
Regulatory Affairs	0	$555,482	0	0	0	N/A	0.00	0	$154,967	0	N/A	0.00
Planning Segment Total	**0**	**$12,568,132**	**0**	**0**	**0**	**N/A**	**0.00**	**0**	**$2,893,701**	**0**	**N/A**	**0.00**
Codes and Standards	0	$80,000	0	0	0	N/A	0.00	0	$20,000	0	N/A	0.00
Market Research	0	$1,692,501	0	0	0	N/A	0.00	0	$331,560	0	N/A	0.00
Product Development	0	$5,265,357	0	0	0	N/A	0.00	0	$150,061	0	N/A	0.00
Research, Evaluations, & Pilots Segment Total	**0**	**$7,037,858**	**0**	**0**	**0**	**N/A**	**0.00**	**0**	**$501,621**	**0**	**N/A**	**0.00**
Portfolio Total	**1,653,800**	**$108,977,795**	**99,615**	**109,198**	**629,026,930**	**3.02**	**1.98**	**622,438**	**$19,395,489**	**1,033,152**	**3.25**	**2.66**
Enerchange	0	$418,500	0	0	0	N/A	0.00	0	$46,500	0	N/A	0.00
Energy Smart	3,200	$511,609	0	0	0	N/A	0.00	2,600	$24,929	0	N/A	0.00
One-Stop Shop	2,742	$18,789,160	0	14,767	80,035,589	2.17	1.49	155	$100,915	7,750	3.37	5.87
Trillion Btu	0	$170,368	0	0	0	N/A	0.00	0	$20,040	0	N/A	0.00
Anticipated Alternative Filings Total	**5,942**	**$19,889,637**	**0**	**14,767**	**80,035,589**			**2,755**	**$192,384**	**7,750**		
Assessments	0	$1,974,981	0	0	0	N/A	0.00	0	$345,600	0	N/A	0.00
Electric Utility Infrastructure	0	$0	0	0	0	N/A	N/A	0	$0	0	N/A	0.00
Portfolio Total w Alternative Filings	**1,659,742**	**$130,842,413**	**99,615**	**123,965**	**709,062,519**			**625,038**	**$19,933,473**	**1,040,902**		

COMPLIANCE WITH RULES & STATUTES

On May 18, 2020, the Deputy Commissioner issued a timeline modification extending the filing deadline for CIP Plans to July 1, 2020 (Docket No. E,G002/CIP-20-473) in light of the COVID-19 pandemic. Therefore, the 2021-2023 CIP Triennial Plan fulfills the Company's compliance with Minn. Stat. § 216B.241, subd. 2(a), which requires public utilities to file CIP plans by June 1 of the applicable year. Additionally, in 2001, the Company received approval from the Department to file a combined gas and electric CIP Plan. We continue with this approach in this Plan.

Minn. R. 7690.0500 contains the requirements and procedures for CIP filings. Minn. Stat. §216B.2401, §216B.241, and §216B.2411 contain provisions the Company must meet in its CIP Plan. This section provides all of the compliance order points required therein.

Statutory Requirements

Minimum Spending Requirement

Minn. Stat. § 216B.241, subd. 1a requires that 2.0 percent requires that 2.0 percent of the Company's electric Gross Operating Revenues ("GOR") be spent on electric CIP and 0.5 percent of gas GOR be spent on gas CIP. Table 8 shows our spending in relation to our minimum spending requirement for 2021, 2022, and 2023.

Table 8: Minimum Spending Requirement (2021-2023)

	2019 Net Revenues (GOR - CIP Exempt)	% of GOR	Minimum Spending Requirement	2021 Proposed Budget	2022 Proposed Budget	2023 Proposed Budget
Electric	$3,013,624,259	2.0%	$60,272,485	$124,877,557	$127,594,440	$130,842,413
Gas	$488,273,433	0.5%	$2,441,367	$18,335,329	$19,050,095	$19,933,473

Goals as a Percentage of Sales

Minn. Stat. § 216B.241, subd. 1c requires utilities to file a CIP Plan with no less than 1.0 percent goals and a statewide goal of 1.5 percent. The table below shows our proposed natural gas and electric goals annually, as percent of the previous three-year (2021, 2022 & 2023) weather-normalized sales, adjusted for exempt customers as of June 30, 2020. Should additional customers be approved for CIP exemption, we may request to modify the baseline to incorporate the effect of those exemptions.

Table 9: Goals as a Percent of Sales (2021-2023)

	Electric			Gas		
Year	**Energy Savings Proposed (MWh)**	**Total Adjusted Sales (MWh)**	**Savings as % of Retail Sales**	**Energy Savings Proposed (Dth)**	**Total Adjusted Sales (Dth)**	**Savings as % of Retail Sales**
2021	714,026	27,845,860	2.56%	958,689	77,527,254	1.24%
2022	711,518	27,845,860	2.56%	1,021,119	77,527,254	1.32%
2023	709,063	27,845,860	2.55%	1,040,902	77,527,254	1.34%

Low-Income Goals

The 2007 Legislature approved an amendment to Minn. Stat. § 216B.241, subd. 7, which required utilities to spend 0.4 percent of their residential natural gas GOR on low-income gas programs and 0.2 percent of their residential electric GOR on low-income electric programs, unless otherwise approved by the Commissioner. The following table provides our proposed low-income spending in comparison to the spending requirement.

Table 10: Low-Income Minimum Spending Requirement (2021-2023)

	% of 2017-2019 average Residential GOR	**% of GOR**	**Low-Income Spend Requirement**	**2021 Proposed LI Budget**	**2022 Proposed LI Budget**	**2023 Proposed LI Budget**
Electric	$1,191,866,039	0.2%	$2,383,732	$2,847,592	$2,948,593	$3,084,572
Gas	$284,593,529	0.4%	$1,138,374	$1,794,107	$1,865,253	$1,922,225

Research & Development Spending Cap

Minn. Stat. §216B.241, subd. 2(c), limits spending on Research & Development ("R&D") to 10 percent of the minimum spending requirement. CIP R&D identifies, assesses, and develops new load management and energy efficiency products and services. This work allows the Company to identify and promote promising new energy saving opportunities for its customers. Market potential studies fall into this category. The following table provides our proposed R&D spending over the Plan period in comparison to the spending cap.

Table 11: Research & Development Spending Cap (2021-2023)

	% of Min Spend	**Min Spend**	**R&D Cap**	**2021 Proposed R&D Budget**	**2022 Proposed R&D Budget**	**2023 Proposed R&D Budget**
Electric	10%	$60,272,485	$6,027,249	$5,149,006	$5,204,376	$5,265,357
Gas	10%	$2,226,786	$222,679	$142,105	$146,068	$150,061

Lighting Use and Recycling Programs

Minn. Stat. § 216B.241, subd. 5 requires utilities to invest in projects that encourage the use of energy efficient lighting and reclamation or recycling of spent fluorescent and high intensity

discharge lamps. Xcel Energy meets this requirement through its business and residential lighting and lamp recycling programs.

Facilities Energy Efficiency
Minn. Stat. § 216B.241, subd. 1f requires all utilities to include in their conservation plans programs that facilitate professional engineering verification to qualify a building as ENERGY STAR-labeled, Leadership in Energy and Environmental Design ("LEED") certified, or Green Globes-certified. The Company's Business New Construction and Commercial Streamlined Assessment programs satisfy this requirement.

Other Compliance

Combined Natural Gas and Electric DSM Plan
Minn. R. 7690.0500, subp. 1, governs the submission of investor-owned electric and natural gas utilities' Conservation Improvement Programs. On March 2, 2009, we filed a variance request to submit a combined electric and natural gas plan on June 1, 2009 as well as with each subsequent annual status report. On May 13, 2009, the Director approved our request for all future CIP Plans and Status Reports.

CIP Plan Contents
Minn. R. 7690.0500, subp. 2, governs the contents of each CIP Plan. Each content component is addressed below.

A. A comprehensive description of the proposed program, including a description of each project making up the program;

Please see the description in each project and segment write-up.

B. For each individual project, a completed project information sheet that will be provided by the department. The project information sheet can be used to provide the information required in items E and F;

We currently utilize the Energy Savings Platform (ESP), a cloud-based IT platform to satisfy this requirement. All information required in items E and F will be uploaded to ESP following the filing of this Triennial Plan.

C. For each project making up the program, a description of the expected effect of each project on peak demand and energy consumption with supporting assumptions, including a list of each conservation technology or process to be promoted and the energy – and demand – savings assumptions associated with each identified technology;

Please see enclosed cost benefit analyses, BENCOST modeling, and technical assumptions for each project.

D. For each electric utility that must submit an integrated resource plan to the Public Utilities Commission, an explanation of how its overall conservation improvement

program enables the utility to meet the long-term demand-side management goals established in its most recent integrated resource plan;

Please see the Executive Summary. We note that the most recent Resource Plan Order in Docket No. E002/RP-15-21 directs us to strive to achieve the 1.5 percent savings goal over the long-term planning horizon. This Plan establishes a goal above the 1.5 percent goal, which is also consistent with both the initial and Supplement Preferred Plan currently under consideration in Docket No. E002/RP-19-368 and will position us well to strive to sustain these high levels of savings over the long-term.

E. An estimate of the expected cost-effectiveness of each project to the utility, to the project's participants, to the utility's ratepayers, and to society;

Please see the enclosed cost-benefit analyses and BENCOST modeling.

F. For each project targeted at residential consumers, an estimate of the anticipated percentage of use of each project among:

a. Low-income participants; and

b. Renters;

The following tables provide estimates of the anticipated percentage of use of each project among:

a. Low-Income participants; and,
b. Renters.

Table 12: Low-Income Participation by Project (Electric), 2021-2023

	2021			2022			2023		
Project	Participation Goal	Low-Income	Percent	Participation Goal	Low-Income	Percent	Participation Goal	Low-Income	Percent
Business Segment									
Multi-Family Building Efficiency	7,208	6,192	85.9%	7,569	6,502	85.9%	7,947	6,827	85.9%
Residential Segment									
Energy Efficient Showerhead	5,840	510	8.7%	5,840	510	8.7%	5,840	510	8.7%
Home Energy Insights	232,000	9,051	3.9%	230,000	8,973	3.9%	235,000	9,168	3.9%
Efficient New Home Construction	5,585	21	0.4%	5,759	22	0.4%	6,001	23	0.4%
Residential Heating and Cooling	18,640	284	1.5%	18,640	284	1.5%	18,640	284	1.5%
Home Energy Squad	8,133	163	2.0%	9,149	184	2.0%	10,293	207	2.0%
Home Lighting	231,508	1,378	0.6%	224,476	1,336	0.6%	218,166	1,299	0.6%
Whole Home Efficiency	212	15	7.1%	234	17	7.1%	268	19	7.1%
Insulation Rebate	1,381	36	2.6%	1,381	36	2.6%	1,381	36	2.6%
Refrigerator Recycling	6,900	144	2.1%	6,800	142	2.1%	6,700	140	2.1%
Residential Demand Response	31,465	1,522	4.8%	31,515	1,524	4.8%	31,565	1,527	4.8%
Consumer Education	477,000	52,470	11.0%	477,000	52,470	11.0%	477,000	52,470	11.0%
Home Energy Audit	3,200	121	3.8%	3,200	121	3.8%	3,200	121	3.8%
Lamp Recycling - Residential	540,000	3,214	0.6%	513,000	3,053	0.6%	495,000	2,946	0.6%
Residential Total	**1,561,864**	**68,930**	**4.4%**	**1,526,994**	**68,672**	**4.5%**	**1,509,054**	**68,749**	**4.6%**
Low Income Segment									
Home Energy Savings Program	1,900	1,900	100.0%	1,919	1,919	100.0%	1,938	1,938	100.0%
LI Home Energy Squad	1,594	1,594	100.0%	1,350	1,350	100.0%	1,793	1,793	100.0%
Multi-Family Energy Savings Program	1,916	1,916	100.0%	1,960	1,960	100.0%	2,058	2,058	100.0%
Low Income Segment Total	**5,410**	**5,410**	**100.0%**	**5,229**	**5,229**	**100.0%**	**5,789**	**5,789**	**100.0%**
TOTAL	**1,574,482**	**80,532**	**5.1%**	**1,539,792**	**80,403**	**5.2%**	**1,522,790**	**81,365**	**5.3%**

Table 13: Low-Income Participation by Project (Gas), 2021-2023

Project	2021			2022			2023		
	Participation Goal	Low-Income	Percent	Participation Goal	Low-Income	Percent	Participation Goal	Low-Income	Percent
Business Segment									
Multi-Family Building Efficiency	2,402	2,192	91.3%	2,523	2,302	91.3%	2,649	2,417	91.3%
Residential Segment									
Energy Efficient Showerhead	49,400	2,467	5.0%	49,400	2,467	5.0%	49,400	2,467	5.0%
Home Energy Insights	131,000	6,129	4.7%	129,000	6,035	4.7%	124,000	5,801	4.7%
Efficient New Home Construction	3,390	14	0.4%	3,494	15	0.4%	3,628	15	0.4%
Residential Heating and Cooling	19,670	413	2.1%	19,670	413	2.1%	19,670	413	2.1%
Home Energy Squad	2,988	41	1.4%	3,362	46	1.4%	3,782	52	1.4%
Home Lighting									
Whole Home Efficiency	198	14	6.9%	212	15	6.9%	234	16	6.9%
Insulation Rebate	996	25	2.5%	996	25	2.5%	996	25	2.5%
Refrigerator Recycling									
Residential Demand Response	14,650	0	0.0%	14,650	0	0.0%	14,650	0	0.0%
Consumer Education	375,000	41,250	11.0%	375,000	41,250	11.0%	375,000	41,250	11.0%
Home Energy Audit	2,600	128	4.9%	2,600	128	4.9%	2,600	128	4.9%
Lamp Recycling - Residential									
Residential Total	**599,892**	**50,481**	**8.4%**	**598,384**	**50,394**	**8.4%**	**593,960**	**50,168**	**8.4%**
Low Income Segment									
Home Energy Savings Program	340	340	100.0%	343	343	100.0%	347	347	100.0%
LI Home Energy Squad	672	672	100.0%	788	788	100.0%	756	756	100.0%
Multi-Family Energy Savings Program									
Low Income Segment Total	**1,012**	**1,012**	**100.0%**	**1,131**	**1,131**	**100.0%**	**1,103**	**1,103**	**100.0%**
TOTAL	**603,306**	**53,685**	**8.9%**	**602,038**	**53,828**	**8.9%**	**597,712**	**53,688**	**9.0%**

Table 14: Renter Participation by Project (Electric), 2021-2023

Project	2021			2022			2023		
	Participation Goal	Renter	Percent	Participation Goal	Renter	Percent	Participation Goal	Renter	Percent
Business Segment									
Multi-Family Building Efficiency	7,208	6,192	85.9%	7,569	6,502	85.9%	7,947	6,827	85.9%
Residential Segment									
Energy Efficient Showerhead	5,840	204	3.5%	5,840	204	3.5%	5,840	204	3.5%
Home Energy Insights	232,000	105,899	45.6%	230,000	104,986	45.6%	235,000	107,268	45.6%
Efficient New Home Construction	5,585	0	0.0%	5,759	0	0.0%	6,001	0	0.0%
Residential Heating and Cooling	18,640	272	1.5%	18,640	272	1.5%	18,640	272	1.5%
Home Energy Squad	8,133	667	8.2%	9,149	750	8.2%	10,293	844	8.2%
Home Lighting	231,508	50,237	21.7%	224,476	48,711	21.7%	218,166	47,342	21.7%
Whole Home Efficiency	212	0	0.0%	234	0	0.0%	268	0	0.0%
Insulation Rebate	1,381	25	1.8%	1,381	25	1.8%	1,381	25	1.8%
Refrigerator Recycling	6,900	169	2.5%	6,800	167	2.5%	6,700	164	2.5%
Residential Demand Response	31,465	847	2.7%	31,515	849	2.7%	31,565	850	2.7%
Consumer Education	477,000	52,470	11.0%	477,000	52,470	11.0%	477,000	52,470	11.0%
Home Energy Audit	3,200	92	2.9%	3,200	92	2.9%	3,200	92	2.9%
Lamp Recycling - Residential	540,000	117,180	21.7%	513,000	111,321	21.7%	495,000	107,415	21.7%
Residential Total	**1,561,864**	**328,063**	**21.0%**	**1,526,994**	**319,847**	**20.9%**	**1,509,054**	**316,947**	**21.0%**
Low Income Segment									
Home Energy Savings Program	1,900	194	10.2%	1,919	196	10.2%	1,938	198	10.2%
LI Home Energy Squad	1,594	469	29.4%	1,350	398	29.4%	1,793	528	29.4%
Multi-Family Energy Savings Program	1,916	1,916	100.0%	1,960	1,960	100.0%	2,058	2,058	100.0%
Low Income Segment Total	**5,410**	**2,579**	**47.7%**	**5,229**	**2,553**	**48.8%**	**5,789**	**2,784**	**48.1%**
TOTAL	**1,574,482**	**336,834**	**21.4%**	**1,539,792**	**328,902**	**21.4%**	**1,522,790**	**326,557**	**21.4%**

Table 15: Renter Participation by Project (Gas), 2021-2023

Project	2021			2022			2023		
	Participation Goal	Renter	Percent	Participation Goal	Renter	Percent	Participation Goal	Renter	Percent
Business Segment									
Multi-Family Building Efficiency	2,402	2,192	91.3%	2,523	2,302	91.3%	2,649	2,417	91.3%
Residential Segment									
Energy Efficient Showerhead	49,400	901	1.8%	49,400	901	1.8%	49,400	901	1.8%
Home Energy Insights	131,000	60,291	46.0%	129,000	59,371	46.0%	124,000	57,070	46.0%
Efficient New Home Construction	3,390	0	0.0%	3,494	0	0.0%	3,628	0	0.0%
Residential Heating and Cooling	19,670	258	1.3%	19,670	258	1.3%	19,670	258	1.3%
Home Energy Squad	2,988	67	2.3%	3,362	76	2.3%	3,782	85	2.3%
Home Lighting									
Whole Home Efficiency	198	0	0.0%	212	0	0.0%	234	0	0.0%
Insulation Rebate	996	22	2.2%	996	22	2.2%	996	22	2.2%
Refrigerator Recycling									
Residential Demand Response	14,650	0	0.0%	14,650	0	0.0%	14,650	0	0.0%
Consumer Education	375,000	41,250	11.0%	375,000	41,250	11.0%	375,000	41,250	11.0%
Home Energy Audit	2,600	73	2.8%	2,600	73	2.8%	2,600	73	2.8%
Lamp Recycling - Residential									
Residential Total	**599,892**	**102,862**	**17.1%**	**598,384**	**101,950**	**17.0%**	**593,960**	**99,659**	**16.8%**
Low Income Segment									
Home Energy Savings Program	340	9	2.5%	343	9	2.5%	347	9	2.5%
LI Home Energy Squad	672	70	10.4%	788	82	10.4%	756	79	10.4%
Multi-Family Energy Savings Program									
Low Income Segment Total	**1,012**	**78**	**7.8%**	**1,131**	**91**	**8.0%**	**1,103**	**87**	**7.9%**
TOTAL	**603,306**	**105,133**	**17.4%**	**602,038**	**104,343**	**17.3%**	**597,712**	**102,163**	**17.1%**

G. A detailed budget for each project for the next three years;

Please see the cost-benefit analyses and BENCOST modeling.

H. A description of the utility's ratemaking treatment and cost-recovery method;

The ratemaking and cost-recovery procedures for this CIP follow those currently approved by the Public Utilities Commission.

I. An estimate of participation in each project;

Please see the enclosed cost-benefit analyses and BENCOST modeling. This information will be uploaded to ESP as part of the filing of this Plan.

J. An explanation of how the proposed projects provide for the involvement of community energy organizations, when appropriate;

Please see enclosed individual program descriptions.

K. An outline of the proposed plan for evaluating the effectiveness of each proposed project;

Please see enclosed program descriptions as well as the Research, Evaluations, and Pilots Segment for a schedule of planned program evaluations. The Measurement and Verification policy is included within this segment.

L. For each renewable energy project, an estimate of the net energy and capacity to be produced by each project and the projected reliability of the technology that would be used; and

There are no planned or proposed renewable energy projects for the Company's CIP portfolio in 2021-2023.

M. Additional information that the Department determines is necessary as a result of its review or evaluation of previous projects of the particular utility.

The Company was instructed to preview significant proposed changes with the Department in pre-filing meetings. The Company previewed proposed changes with the Department on June 11, 2020.

Additionally, from the 2020 CIP Extension Plan, the Company has elected to discontinue the ENERGY STAR Retail Products Platform (ESRPP) program due to concerns over cost-effectiveness. The Company will continue to assess the market for any future product or program opportunities.

Business Segment

Description
The Business Segment mostly serves our customers not on a residential rate. This broad and varied Segment has historically contributed a significant portion of the energy savings to the Company's DSM portfolio and is expected to continue to do so in the future.

The Company offers study funding, as well as prescriptive, custom and holistic rebates in order to best serve business customers over a broad range of technologies. Our program portfolio encourages customers to choose high efficiency options ranging from a simple lighting fixture replacement to the inclusion of energy efficiency in the design of an entire new facility. Study programs also offer assistance to customers whether they need to identify simple energy efficiency opportunities, or they are considering a complex manufacturing process change. Holistic programs foster a deeper level of customer commitment to energy efficiency and engage customers in long-term energy planning intended to change the way customers look at energy and conduct their business.

Overall Goals
The Business Segment contributes a significant portion of Xcel Energy's planned savings achievements in this Plan. Our Business Segment goals for this Plan period are outlined in the following table:

	Electric				Gas		
Plan Year	**Participation**	**Budget**	**Gen kW**	**Gen kWh**	**Participation**	**Budget**	**Dth**
2021	105,607	$54,168,651	108,712	418,426,313	5,406	$5,046,601	536,578
2022	102,957	$55,461,862	125,562	417,362,227	5,666	$5,319,945	579,017
2023	102,457	$56,849,023	142,680	419,326,539	5,875	$5,522,055	581,420

Marketing/Advertising/Promotion
We rely on trade allies, end-use equipment vendors, account managers, and dedicated energy efficiency sales specialists to drive energy savings and load management achievements in the Business Segment. Although sales to the largest business customers typically require personal interaction, the Company also utilizes a variety of tactics and channels, including: newsletters, customer events, direct mail, email communications, awareness advertising and social media to build awareness and drive program activity. In this Plan the Company strives to drive deeper energy savings across the portfolio by expanding our messages in the marketplace. To support its marketing efforts, the Company will employ an integrated approach to communications, where the tactics are designed to work in concert with each other to reinforce key messages over time.

We also market our programs as customer solutions to various business segments; focusing on the segments which have significant potential and the segments in which participation is under performing compared to others. Multimedia campaigns are used to provide each segment customized tools and information and to direct them to the most applicable programs in our portfolio.

Overall Policies
The Company has adopted several general policies that guide the implementation of Business Segment programs. Individual programs may follow different policies as noted in the program descriptions. The general policies provide overall management direction; however, they may be modified when warranted and within guidance documented in statute or from the Dept. of Commerce.

The segment-level policies include:

- Cost-Effectiveness Tests: All customer projects going through the custom analysis process must pass the Societal Tests with an absolute ratio of 1.0 or greater.
- Proof of Installation: All programs require documentation of installation, such as proof of purchase (e.g., invoices) or site verification.
- Installation Date: Rebates are provided for equipment installed within 12 months of purchase or project completion unless otherwise noted in the individual program policies.
- Payback Requirements: Projects must have a payback longer than nine months, and cannot exceed the expected lifetime of the equipment.
- Studies: Study funding cannot exceed 75 percent of the incremental cost unless otherwise noted in the individual program policies.
- Influenced Savings refers to projects for which Xcel Energy played a significant role in the customer's decision to implement an energy efficiency measure, and for which the customer participated in the normal Custom Efficiency project submission process, yet whose cost-effective analysis or payback period failed. For such projects, Xcel Energy denies the customer any rebate for the measure but claims Influenced Savings in order to appropriately account in the Company's energy and demand savings for the implementation of the higher energy efficiency technology and to recognize the often-significant labor investment and/or study costs involved in the project. Influenced savings guidelines are listed below:

    1. Project approval – Must follow program guidelines.
    2. Cost-Effectiveness Tests – Projects must pass the and Societal Tests.
    3. Payback – Projects with a payback period of less than nine months may be considered only if they meet all the other Influenced Savings guidelines herein.
    4. Large Projects – Projects with savings of 2 GWh and greater require separate DER pre-review. All other projects will be reviewed as part of the Status Report.
    5. Savings Cap – Influenced Savings claims cannot exceed 4% of the Company's annual CIP achievements.
    6. Documentation – Documentation must be provided to show Xcel Energy's involvement was an important factor in implementing the energy saving project.

- Study-Driven Credit: If a customer implements measures identified in an Xcel Energy study or assessment, or identified in a study funded by Xcel Energy, and the measure has a payback period of less than nine months or longer than the expected lifetime of the equipment, the customer will not receive a rebate, but the Company will claim those savings as study-driven credit. We believe that our help identifying and analyzing the energy efficiency measures provides influence on the customer's decision to implement those measures. These savings do not count toward Influenced Savings. All programs that fund studies are eligible to claim study-driven credit.

- Program Incentives: Custom projects limit rebates to 60 percent of the actual project cost. Prescriptive rebate levels are set based on deemed incremental costs and rebates are capped at 60 percent of actual total project cost; this practice helps ensure we do not pay more than 60 percent of the incremental cost for a specific project for which the pricing varies from the deemed cost. Bonuses and special offers may increase the rebate cap as a percent of incremental cost, but we strive to ensure that it never exceeds 100 percent.

Involvement with Interested Individuals and Entities

The Company regularly works with several local organizations to refine our existing programs, shape new programs, and discuss partnership opportunities. These local organizations include, but are not limited to:

- Building Owners and Managers Association;
- Center for Energy and Environment;
- CenterPoint Energy;
- Enterprise Minnesota;
- Minnesota Blue Flame Gas Association's Conservation Committee; and
- Minnesota Technical Assistance Program.

In addition to local contacts, we also regularly work with regional and national organizations, including:

- American Council for an Energy Efficient Economy;
- Cadmus;
- Cascade Energy;
- Chartwell, Inc.;
- CLEAResult Midwest;
- Compressed Air and Gas Institute (CAGI);
- Consortium for Energy Efficiency;
- Department of Energy/ENERGY STAR;
- Design Lights Consortium (DLC);
- Ecova;
- E Source;
- Electrical Apparatus Service Association;
- Evergreen Economics;
- Franklin Energy;
- Hydraulic Institute Pump Systems Matter (PSM);
- Michael's Energy;
- Midwest Energy Efficiency Alliance; and
- Motors Decisions Matter (MDM).

Business Energy Assessments

Description
The Business Energy Assessments program, which is an expansion of the previous Recommissioning program, offers study funding and electric and natural gas implementation rebates to commercial and industrial customers who improve their building performance through an energy assessment. The program is primarily marketed through our account managers, energy efficiency specialists, and approved study providers.

The program's main offerings include the following:

- Prescriptive rebates for the end-uses rebated in our other prescriptive programs;
- Custom rebates for any energy-saving opportunities eligible for rebates under our other custom programs;
- Operationally-focused rebates for implementing recommissioning or building system tune-up measures identified through a study;
- Subsidized assessment options that identify energy-saving opportunities. Customers pay a portion of the assessment cost based on their size;
- Free implementation services to help customers implement energy-saving opportunities; and
- Rebates to off-set the cost of Building Operator Certification training.

Assessments Suite
Customers signing up for an assessment through the Business Energy Assessments program will receive a whole-building energy analysis. This assessment includes a utility bill analysis, a thorough walkthrough of the entire facility and a list of energy-saving strategies with savings estimates, as well as associated cost and rebate values. The assessment options are listed below:

1. Industrial Streamlined Assessment – Affordable, quick-to-complete whole-facility assessment for small-to-midsize industrial customers.
2. Building Assessment – Previously filed as Recommissioning, this assessment focuses on optimizing existing equipment within facilities. Prescriptive and Custom energy-saving opportunity rebates will be identified where applicable.
3. Targeted Building Assessment – Additional replacement for Recommissioning program, this offering encompasses the same components as the Building Assessment but at a greater depth. A detailed, comprehensive assessment that will be tailored to highly-engaged customers that have an expectation of building an ongoing relationship with their study provider and utility.

Implementation Services
The program offers a variety of services that customers may choose from depending on their specific needs to help them implement their projects. The intent of adding an implementation consultation is to improve the conversion rate on energy-saving opportunities identified in our study offerings. Services include, but are not limited to:

- Attending internal stakeholder customer meetings to obtain approval;
- Assistance with prioritizing projects;
- Financial analysis of implementing measures;
- Bidding process review;

- Coordination of implementation;
- Verification of installation; and
- Paperwork compilation and rebate submission.

Program Changes
The following table summarizes changes to the program in this Plan.

Change	Rationale
Update eligible measures	Expanding the scope of our Recommissioning program enables a comprehensive, whole-building assessment approach rather than a singular focus on low/no-cost operational improvements.
Add Demand Response measures	As part of our strategy to increase participation in demand response programs, this program will be offering Saver's Switch for Business, Peak Partner Rewards and AC Rewards for Business Control for assessment customers.
Add implementation-focused consultation services	As part of our strategy to improve the conversion rates for energy-saving opportunities identified in our study portfolio, customers will have access to free-of-charge implementation support.

Budget and Goal Considerations
The program's participation, energy savings goals, and budget were determined by looking at historical program performance in the previous Recommissioning program and subsequent end-use opportunities identified in our portfolio.

The main budget drivers include the following:

- Administration –includes labor estimates which are based on historical spending.
- Third Party Customer Services –includes scoping and project management services provided directly to the customer.
- Promotion –includes promotional outreach tactics to generate awareness of the new assessment offerings and encourage participation.
- Participant Incentives –reflects the assumed participation across multiple end-use programs based on the average project implementation numbers from the last three years.

The increase in comparison to historical costs is directly related to the expanded, whole building studies we are planning to administer.

Involvement of Community Energy Organizations
None.

Business New Construction

Description
The Business New Construction program influences owners, architects, and engineers to include energy efficient systems and equipment in their designs for new construction, additions to existing buildings and/or major renovation projects. We provide consulting services and energy modeling, as well as electricity and natural gas efficiency implementation rebates. The program is primarily marketed by our sales team and consultants to design teams and customers who want to build energy efficiency into their building design.

The program's main offerings include the following:

- Prescriptive rebates, including motors, cooling and heating equipment identified in the Energy Efficient Buildings program component; and
- Custom rebates for energy efficiency strategies incorporated into the building design through either the Energy Efficient Buildings or the Energy Design Assistance program component.

The main offerings are described below:

Energy Design Assistance
The Energy Design Assistance (EDA) offering provides business customers with energy expertise to encourage energy efficient building design and construction practices. EDA offers real-time energy modeling so the project team can visualize the impacts of their efficiency choices. The program encourages an integrated approach to the design process by providing free computer energy modeling of the project design, funding to offset the cost of design time associated with the increased energy analysis, financial incentives to improve the cost-effectiveness of a package of energy efficiency measures, and field verification to ensure that the strategies are installed per the design intent.

There are two tracks available for customers: Standard and Enhanced. The Standard track is for projects that are 20,000 square feet or greater in size that are in the schematic design or early design development phase. Rebates are based on peak coincident demand and energy savings (PC kW, kWh, and Dth); the project must achieve a minimum of 5% savings over the baseline to be eligible for the rebate.

The Enhanced track is for customers registered with a sustainable building certification program such as the United States Green Building Council's (USGBC's) Leadership in Energy and Environmental Design (LEED) or Minnesota B3. The Enhanced track provides additional analysis in the early stages of design for HVAC, daylighting, and massing analysis. T he Enhanced Track is for projects that are at least 50,000 square feet that are in the pre-design or early schematic phase. The project must achieve a minimum of 30 percent demand savings over the baseline to be eligible for the rebate.

We administer the EDA program with help from outside energy design consultants who facilitate meetings with the design teams and building owners, and complete energy modeling activities. Beginning in 2021, the baseline for new projects enrolled in the program is based on the updated Minnesota State Energy Code referencing the ASHRAE 90.1-2016 Energy Standard.

Energy Efficient Buildings (EEB)

The EEB offering is intended to provide a simplified approach to optimizing energy efficiency options in new construction, additions, and major renovations. This component addresses the portion of the new construction market not suited for the full-blown energy modeling of the EDA offering. It offers design review, equipment recommendations, and onsiteverification.

Focusing on the needs of smaller building owners, the EEB offering provides a comprehensive list of typical energy efficiency measures that can be incorporated into the new building design, as well as the rebate amounts for each measure. Incentives are provided for heating, cooling, lighting, motors, and custom opportunities. We administer the program using both internal and external resources to review the calculations, recommend equipment, and verify installation. EEB is a free service to our business customers. Any size building may participate, but this component is best suited for buildings that are between 5,000 and 20,000 square feet. Projects must enter the program prior to completion of construction documents.

Unlike many other programs, the Business New Construction program verifies incremental project costs at a program level, rather than project level. Because of the large scale of most projects, the final costs for all energy savings implemented within the building are difficult to identify individually. Instead, we use the best estimate of costs from the design team and our Consultants to project the energy savings costs. The payback criterion is estimated using the same cost definitions as incremental cost.

New, targeted, niche offerings for the Business New Construction program include:

Code Support

New to this Plan, is an offering to support communities by improving code compliance when new energy performance codes are implemented. This is based on the findings of the Commercial Energy Code Compliance Enhancement Pilot, which was a recipient of a CARD Grant. The program will provide training and support for city code officials in reviewing new construction or major renovations of buildings over 50,000 square feet. The research determined that these buildings tend to be more complex and present the greatest opportunity for the program to have an impact on aligning performance with the expected effects of energy codes.

City staff will be provided a report that includes specific recommendations on actions that could bring each item into compliance. The review will focus on approximately 24 energy code line items that have the highest potential for identified savings. These items represent approximately 14% of all energy code requirements. Furthermore, this initiative is intended to help build a foundation for any future code compliance programs that may be recommended as part of an ongoing CARD study (Minnesota Codes and Standards Program: Concept to Realization Roadmap).

Achievement will be based on the savings identified to bring the projects up to code. Therefore, there will not be any duplication of claimed savings for programs that incentivize buildings to perform beyond code, should these projects also participate in EDA or EEB.

AC Rewards for Business for Multi-Family New Construction

The multi-family segment currently makes up a significant portion of the new construction market, so the Business New Construction program will offer a unique demand response option for these customers.

The Company will provide customers free smart thermostats, with demand response capabilities, to install in each unit within the facility. Participating tenants will receive annual bill credits, in exchange for allowing the Company to temporarily adjust the set point on the thermostat during control events. AC Rewards for Business participants retain the ability to override individual control events, except in the case of a systems emergency.

Program Changes
The following table summarizes changes to the program in this Plan.

Change	Rationale
Add Demand Response measures.	As part of our strategy to increase participation in demand response programs, this program will be offering Saver's Switch for Business, Peak Partner Rewards and AC Rewards for Business for multi-family new construction.
Update rebate offer.	To place more value on energy savings that occur during peak coincident periods.
Baseline change for EDA.	Adopting the Minnesota State Energy Code referencing the ASHRAE 90.1-2016 Energy Standard.
Add Code Support measure.	As part of our strategy to support code compliance initiatives, this program will add a code support offering for municipal building code officials.

Budget and Goal Considerations
The program's participation, energy savings goals, and budgets were determined by reviewing historical achievement and the state of the construction market industry. In recent years, the construction market has been very active. Although, we see signs that growth may be tapering off, given the time to complete these projects, the buildings currently in development will drive most of the achievement for this Plan. The main budget drivers include the following:

- Incentives – Customer rebates and vendor incentives make up most of the budget. In addition to customer incentives, the EDA product provides incentives to design teams to offset the extra expense associated with participation.
- Consulting and Customer Service – These activities are associated with the cost of analyzing building plans, developing energy models, identifying energy efficiency opportunities, as well as time spent conducting customer meetings.
- Measurement and Verification – All EDA and EEB projects are verified using on-site visits.

Involvement of Community Energy Organizations

The New Construction program engages customers, trade allies, and other stakeholders at the individual project level and supports organizations including the United States Green Building Council (USGBC-MN) and the Center for Sustainable Building Research (CSBR).

Commercial Efficiency

Description
The Commercial Efficiency program is a strategic energy management approach to creating persistent savings and continuous improvement. In addition to capital equipment improvements for energy efficiency and demand response opportunities, the program stresses system-level operational changes as well as cultural changes from customers' senior management, mid-management and other personnel. The program is targeted to large commercial customers that have at least 1 GWh or 4,000 Dth of conservation potential and offers customized resources to develop a holistic, sustainable energy management plan. This program provides funding for studies to identify and scope energy efficiency opportunities. Rebates are available to customers who implement qualifying energy efficiency recommendations. This program is marketed by Xcel Energy's account managers.

The program offerings are delivered in multiple phases. Each phase is defined in a Memorandum of Understanding that is customized to reflect the needs of the specific customer. Typical phases are described in the following sections.

Phase 1: Identification
Xcel Energy performs a high-level analysis to identify opportunities for energy savings in the customer's business practices, facilities, and operations. This is completed at no cost to the customer. Phase 1 is delivered using a third-party provider selected through a Request for Proposal (RFP) process.

Phase 2: Scoping
This phase provides support and resources to further define, measure, and provide recommendations and assistance for energy savings opportunities while working with the customer to optimize the business practices identified in Phase 1. Total funding for Phase 2 is based on estimated savings and a typical customer is asked to contribute up to 25 percent with a maximum amount of $7,500 or an equivalent investment or commitment. The purpose of the customer contribution is to ensure management-level engagement and the customer's commitment to a holistic approach. Phase 2 is delivered using internal resources and/or third-party technical experts selected through an RFP process, or through technology-specific experts of the customer's choosing.

Phase 3: Implementation Plan
Xcel Energy will work with the customer to put together an energy management plan which includes conservation goals, energy conservation and demand reduction projects. This phase includes a customized rebate and bonus schedule that rewards deep savings and/or a system-wide approach.

Upon project completion, customers receive rebates for improvements that qualify for any of our prescriptive or custom programs. The savings are included in the Commercial Efficiency program achievements, but they mirror the rules and rebate levels of our other programs. If the improvements do not qualify for rebates due to program rules, we claim the project savings in a manner consistent with our study-driven credit policy

Phase 4: Energy Performance Indicator Services
Phase 4 is an option for customers who are interested in ongoing commissioning and/or continuous improvement. Specifically, this phase provides consulting services that support the customer through

the process of installation, integration, and commissioning of energy information systems to demonstrate repeated and consistent improvements in energy usage. These services are offered to develop a baseline energy model and measurement and verification of energy savings due to behavior change and low-cost/no cost operational improvements. The offering can be done in conjunction with the Phase 2 offering or later in the engagement process.

Policies

Due to the holistic nature of this program, several policies have been previously filed and approved by the Department and continue to remain in effect:

- Bundling: When customers identify multiple measures for installation, a bundle can be evaluated to see if it qualifies for a rebate versus each individual component. This allows measures with too short of a payback for a rebate to be leveraged to drive projects with too long a payback for the customer to install so that both are implemented.
- Preapproval dates: Custom-type measures in Commercial Efficiency require a custom analysis, but the actual date the project is submitted does not disqualify a project if it was initiated after the customer entered into the program. This is due to the extensive resources used by the program to identify and scope ways to drive energy efficiency into how a customer does business. The goals and awareness created during Phases 1 and 2 can result in projects that drive energy savings in business areas that act without immediately notifying the personnel in contact with Xcel Energy.
- Rebate bonuses: We will use the rebate structure of the other end-use programs and then incorporate additional rebate bonuses for system optimization and/or exceeding annual achievement targets.
- Facility-level metering: We have worked in advance with the Department to define the methodology of how we propose to take credit under this metering scenario. Facility-level metering provides us the ability to accurately account for all savings generated by installation of a measure and incorporate the savings that may be driven plant-wide that we have been unable to accurately capture historically.
- Behavioral Savings: We use the Department's Average Savings Method to count behavioral savings created through single entity-based behavioral change efforts. This also could apply to technical projects that require specific behaviors to maintain persistent energy savings throughout their lifetime.

Program Changes

We are making the following changes to the program for this Plan.

- Generic load shapes for custom projects will no longer be used. Project specific load shapes will be used to determine marginal energy benefits. The reason for this change is to ensure higher accuracy of the marginal benefits that a project will provide. It will more accurately consider the seasonal and hourly variation of the energy savings.
- As part of our strategy to increase participation with the Company's demand response offerings, this program will be offering Saver's Switch for Business, Peak Partner Rewards, Electric Rate Savings and AC Rewards for Business. Further details on Demand Response measures are provided in the Technical Assumptions.

Budget and Goal Considerations

We determined the program's participation, energy savings goals, and budgets by examining historic participation levels, project and participation cycles, and costs.

The main budget drivers include the following:

- Administration – These costs are driven by marketing, sales, engineering, and external labor resources to support the Company's heavy engagement with the customer, as well as cover the costs of those projects requiring metered verification.
- Customer Service – The Company utilizes third-party resources to deliver the program's identification and scoping phases.
- Participant Incentives – The program has a robust rebate budget due to the size of projects initiated through the Commercial Efficiency program. In addition to standard rebates, Commercial Efficiency offers lucrative bonus rebates for exceeding energy savings and/or implementing projects on a system-wide approach.

Involvement of Community Energy Organizations

The Commercial Efficiency program works with Community Energy Organizations to promote the program and deliver its offerings. In particular, the Trillion BTU financing delivered by the St. Paul Port Authority and Xcel Energy could help customers fund large capital projects when financing is a barrier to implementation. We consider leveraging resources as they become available through these and other external organizations and consider integrating their offerings into both our program and our customers' energy management plans.

Commercial Streamlined Assessment

Description
The Commercial Streamlined Assessment program, which was formerly called the Turn Key Services program, is designed to remove hurdles for our business customers of all sizes when identifying and implementing energy efficiency projects. The program is primarily promoted through our energy efficiency specialists and account managers. We work closely with our third-party consultant to fulfill the program.

The program's main offerings include the following:

- Prescriptive rebates for the end-uses rebated in our other prescriptive programs;
- Custom rebates for any energy-saving opportunities eligible for rebates under our other custom programs;
- A subsidized assessment that identifies energy saving opportunities. Customers pay a portion of the cost based on their size; and
- Free implementation services to help customers implement energy-saving opportunities.

The main offerings are described below.

Identification of Measures
Customers signing up for an assessment receive an ASHRAE Level I audit. This assessment is a walkthrough of the entire facility and involves an analysis of the customer's utility bills and includes graphs that show how much energy is being used by each end use. The assessment identifies simple low/no cost opportunities in addition to higher cost conservation opportunities. An ENERGY STAR Benchmarking score is calculated for all applicable building segments. All opportunities also include energy savings estimates, cost savings and applicable rebates.

Implementation Services
The program offers a variety of services that customers may choose from depending on their specific needs to help them implement their projects. Services include, but are not limited to:

- Attending internal stakeholder customer meetings to obtain approval;
- Assistance with prioritizing projects;
- Financial analysis of implementing measures;
- Bidding process review;
- Coordination of implementation;
- Verification of installation; and
- Paperwork compilation and rebate submission.

Funding
Participants are eligible for prescriptive and custom rebates for installed and implemented energy-saving opportunities. Customers can qualify for a bonus rebate if they implement their recommended opportunities within an established timeframe. In addition, we subsidize assessments and implementation services to encourage customers to move beyond the barriers to participation.

Consistent with other custom type projects, we anticipate there will be projects identified through

the program that are custom in nature and payback to the customer is less than nine months. The Company claims study-driven credit for these projects.

Program Changes
The following table summarizes changes to the program in this Plan.

Change	Rationale
Name Change	The name of this program will be changed to "Commercial Streamlined Assessment" to illustrate to customers, vendors and internal stakeholders its position in relation to the new Business Energy Assessments program.
Add Demand Response measures	As part of our strategy to increase participation in demand response programs, this program will be offering Saver's Switch for Business, Peak Partner Rewards and AC Rewards for Business for assessment customers

Budget and Goal Considerations
The program's participation, energy savings goals, and budgets were determined by examining historical program performance and study participation.

The main budget drivers include the following:

- Administration – includes labor estimates which are based on historical spending.
- Third Party Customer Services – includes scoping and project management services provided directly to the customer.
- Promotion – includes promotional outreach tactics to increase awareness and encourage participation. It is always important to build a pipeline of audits for Commercial Streamlined Assessment to help with future goals.
- Participant Incentives – reflects the assumed participation across multiple end-use programs based on the average project implementation numbers from the last three years.

Involvement of Community Energy Organizations
None.

Compressed Air Efficiency

Description
The Compressed Air Efficiency program, formally known as the Fluid Systems Optimization program, offers study funding to perform system diagnostics, as well as prescriptive and custom rebates for the purchase of energy saving equipment. System diagnostic studies based on the laws of fluid system dynamics are funded as a means to identify and correct inefficiencies within customers' compressed air systems. Studies often identify additional measures to improve system efficiency. The program is primarily marketed to mid- to large-sized industrial customers.

The program's main offerings include the following:

- Prescriptive Rebates for:
  - Variable speed drive compressors;
  - No loss air drains;
  - Cycling refrigerated dryers;
  - Dew point demand controls; and
  - Mist eliminators.
- Custom and Recommissioning rebates including, but not limited to:
  - Calibration/tune-up of system set points;
  - Adjustment of valves and dampers;
  - Reducing system demand;
  - Air to electric conversions;
  - Capital equipment replacements and upgrades; and
  - System redesigns.
- Compressed air supply-side and demand-side studies.

The main offerings are described below.

Prescriptive Rebates
The program offers rebates for qualifying prescriptive equipment.

Custom Rebates
The program pays custom rebates for qualifying energy saving measures that are not included under the prescriptive rebate category. Such projects are evaluated under the Custom Efficiency analysis and must follow the rules of the Custom Efficiency program. The Company also rebates qualifying system tune-ups, waste reduction efforts, and non-capital equipment changes that are identified in a study and do not fit into the prescriptive rebate category.

Compressed Air Supply-Side Study
A customer's pre-approved Compressed Air Supply-Side Study cost is eligible for reimbursement after 75 percent of the leaks identified have been repaired and the study has been reviewed by a Company engineer or an authorized consultant. The studies are based on the customer's existing system horsepower and identify a customer's supply baseline and system improvements.

System Studies
The Company will pay study funding of up to 75 percent of the study cost not to exceed $25,000. A rebate incentive is offered to customers for all implemented measures, regardless of the payback, and

the maximum incentive is the customer's out of pocket cost for their study (i.e. study cost minus study rebate).

Program Changes
The following table summarizes changes to the program for this Plan.

Change	Rationale
Generic load shapes for custom projects will no longer be used. Project specific load shapes will be used to determine marginal energy benefits.	To ensure higher accuracy of the marginal energy benefits that a project will provide. It will more accurately take into account the seasonal and hourly variation of the energy savings.
Offer Peak Partner Rewards.	As part of our strategy to increase participation with the Company's demand response offerings, this program will be offering Peak Partner Rewards. Further details on demand response measures are provided in the technical assumptions.

Budget and Goal Considerations
The program's participation and energy savings goals and budget were determined by looking at the Company's overall electric goal and past participation levels.

The main budget drivers include the following:

- Participant Incentives – This budget represents the rebates we will pay for energy efficient equipment and studies. This is based on historical participation across the offering and includes predicted growth in the legacy products and new opportunities from the new study offerings.
- Administration – These budgets are based on past program performance with an increase built in for increased participation and technical engineer support.
- Promotion – This budget will assist in raising awareness of the program and provide training to customers and trade to establish the Company as an expert in the market. Promotional dollars include an increase to support an increased savings goal.

Involvement of Community Energy Organizations
The Compressed Air program partners with the U.S. Department of Energy (DOE) to provide training on the Compressed Air Challenge program and Fan Systems. We have partnered with the Consortium for Energy Efficiency to establish best practices for industrial systems including blower systems and pumping.

Custom Efficiency

Description
The Custom Efficiency program offers rebates to electric and natural gas business customers that implement energy saving projects not available through our prescriptive programs. The program is marketed to all business customers regardless of size using direct contact with customers via our sales representatives, the internet, and trade channels.

Energy-saving, non-prescriptive projects encompass installing new equipment, replacing existing equipment, retrofitting equipment or improving processes that lower a customer's electric or natural gas use. The project list includes, but is not limited to: boilers, compressed air, cooling, lighting, motors, and other technologies, all of which must pass cost-effectiveness on an individual project basis.

This program also offers study funding to help customers determine project viability and energy savings potential.

Equipment Rebates
Rebate amounts are defined by the engineering examination of the demand and energy savings attributed to the project. The analysis incorporates standard engineering principles, relative to industry standards and the interactive energy effects of the equipment and/or system components. Successful applicants receive a rebate if their completed project passes cost-effectiveness testing.

Study Funding
Successful applicants receive partial funding based on an engineering assessment of the estimated demand and energy savings of the project.

Program Changes
In this Plan, the Company will update its rebate offer to place higher value on energy savings that occur during peak coincident periods.

Budget and Goal Considerations
The program's participation, energy savings goals, and budgets were determined by looking at the overall electric and gas goals, analyzing historical data, reviewing projects in the pipeline, and evaluating the forecasted economic conditions. We also included other variables such as promotions needed to reach goals, rebate levels, and staffing. Projected customer participation and savings are based on expected average project size and mix of technologies anticipated.

Involvement of Community Energy Organizations
None.

Data Center Efficiency

Description
The Data Center Efficiency program offers prescriptive and custom rebates to business customers that install energy saving measures in their existing or new data center. The program also offers rebates for data center energy studies. The program is primarily marketed to our enterprise and colocation data center customers through our account managers and Business Solutions Center, but any size data center can participate. We also work closely with our trade partners, specifically engineering firms, technology services firms, mechanical contractors and manufacturers' representatives to market the program.

The program's main offerings include the following:

- Prescriptive rebates for efficiency improvements falling under any of the end-use prescriptive programs we offer.
- Custom rebates are awarded for efficiency measures such as:
    - Air-flow management;
    - Server and IT systems;
    - Cooling systems;
    - Humidification systems;
    - Transformers; and
    - Uninterruptable Power Supplies (UPS).
- Study funding is available to identify and/or quantify energy savings projects.
- Design Consulting Services are available for customers building a new data center, free of charge, to help data center owners optimize the efficiency of their facilities during the siting, design, and early operation stages of the new data center. Custom rebates are available for the efficiency improvements incorporated into the design, like the Company's Energy Design Assistance Program.

Program Changes
The following table summarizes changes to the program in this 2021-2023 CIP Triennial Plan.

Change	Rationale
Update rebate offer	To place more value on energy savings that occur during peak coincident periods.
Replace EC Motor Plug Fan Rebates with Rebates for CRAC units	Retrofit EC Motor Plug Fans are no longer cost effective and new construction EC Motor Plug Fans with control are now standard equipment. New rebate for CRAC unit will incentivize overall performance of cooling equipment.

Budget and Goal Considerations
The program's participation, energy savings goals, and budgets were determined by looking at the Company's overall electric goal, past participation levels, current pipeline, and expected project lead time. We also reviewed the equipment and project characteristics of recent project analyses to develop a projected average savings per participant for various program offerings.

The main budget drivers include the following:

- Rebates and Incentives – The majority of the program budget is allocated to rebates and vendor incentives. The budget reflects the updated rebate structure and projected customer participation in each offering, which is based on 2018 participation combined with future pipeline data.
- Labor – This budget is based on past program performance.
- Consulting – Fees, based on historical spend and projected activity, are primarily to provide consulting services for new construction projects.
- Promotion and Advertising – Promotion budgets is based on historical spend and includes limited advertising spend to perform data center specific advertising.

Involvement of Community Energy Organizations

The Data Center Efficiency program works with multiple community energy organizations, ranging from trade partners and installers to local industry organizations. Xcel Energy hosts program and technical training and information sessions for trade partners and sponsors and presents at local industry chapter organization meetings and events.

Efficiency Controls

Description
The Efficiency Controls program offers custom electric and gas rebates to customers that install automated control systems resulting in energy savings. These systems are centralized networks programmed to monitor and control mechanical and sometimes lighting systems within a building, allowing customers to reduce energy costs by adjusting usage of equipment. The program is marketed to all business customers.

The program offers custom rebates for:

- New and updated automated control systems;
- Adding control points to an existing system; and,
- Microprocessor-based control panels.

To be eligible for a rebate, customers are required to submit their rebate application prior to purchasing or ordering equipment. Once all project-related documents are submitted, including the workbook, the Company evaluates the project, estimates energy savings of the proposed system, and notifies the customer of rebate qualification and estimated rebate amount.

We anticipate customer demand for digital control system rebates to continue to decline for the following reasons:

- Many customers have already converted to newer digital control systems, though some may be ready to implement round two of a digital system;
- Customers already using a digital control system have an increased interest in other services, such as data-driven, cloud-based energy reporting systems; and,
- New LED fixtures with integrated controls are far more cost-effective with greater overall energy savings than simply retrofitting controls for existing lighting.

Program Changes
As part of our strategy to increase participation in demand response programs, this program will be offering Peak Partner Rewards and Electric Rate Savings. Further details on demand response measures are provided in the technical assumptions.

Budget and Goal Considerations
The program's participation, energy savings goals, and budget were determined by analyzing the overall electric and gas goals, historical program performance, current technology, and market conditions as described above.

The main budget drivers include the following:

- Rebates
- Trade incentives
- Promotions
- Labor – Internal labor to market and administer program offerings are estimated based on historic spend.
- Consulting – Supporting engineering and staff augmentation to ensure accurate consistent analyses and support any M&V efforts as needed.

Involvement of Community Energy Organizations
The Efficiency Controls program works with an array of community energy organizations, ranging from trade partners and installers to local industry organizations.

Energy Information Systems

Description
The Energy Information Systems (EIS) program offers custom electric and gas rebates along with consulting services to customers that implement behavior change and low cost/no cost operational improvements. The program primarily targets large commercial and industrial customers via a strict selection process. Some of the original 14 customers are coming to the end of their participation period and are being strategically replaced.

The program's main offerings include the following:

- Consulting services to help a customer select an EIS solution provider;
- Consulting services to support the customer through process of installation, integration, and commission of the EIS;
- A 30% incentive towards the purchase and installation of the EIS;
- Consulting services to develop a baseline energy model and M&V plan for the facility;
- Measurement and verification (M&V) of energy savings due to behavior change and low-cost/no-cost operational improvements;
- Ongoing consulting services for a period of up to 36 months of participation; and
- Custom rebates for energy savings due to behavior change and low-cost/no cost operational improvements.

EIS will use a three-phase approach to implement the process and capture deeper energy savings. The customer's formal acknowledgement of planned participation in the program begins with the customer signing a Memorandum of Understanding (MOU) prior to beginning Phase 1. The Company views the signing of the MOU as formally establishing a date of influence for all projects completed under the umbrella of the product.

PHASE 1: Setup
Before the customer selects an EIS solution provider, the Company will work with the customer to identify the metering and communications needs, existing sources of data, and opportunities to improve data collection through new metering or data logging equipment for the site. At this time, the Company and the customer will establish a common understanding of goals for the metering solution as well as the definition for how efficiency for each building and system is characterized. The Company will help the customer select an EIS solution provider that meets their specific needs and pre-qualify EIS providers to ensure solutions will enable accurate and reliable M&V for the program. Once the system installation is verified and approved, the Company will pay an installation incentive to help cover the up-front cost of the EIS.

PHASE 2: Treatment
Once the EIS is operational it will take a period of time to sufficiently capture the data required to inform the identification of energy efficiency opportunities. These opportunities are expected to arise in a variety of behavioral, operational, and capital forms.

- Behavioral – with visibility and tighter management of energy performance metrics, occupants and end users are expected to be more engaged in reducing energy consumption.
- Operational – low cost/no cost measures associated with tune-up of equipment or scheduling of equipment operating times.

- Capital – expansion of controls systems or new/improved end-use equipment and systems.

Frequent communication with the customer and thorough documentation throughout this phase will be required to ensure that new measures are discovered and implemented.

PHASE 3: Verification

On an annual basis, an analysis will be compiled that delineates savings achievements from each primary measure identified in Phase 2. Capital measures will be analyzed and incented though the Company's prescriptive and custom programs. Behavioral and low cost/no cost operational measures will be analyzed using a "top-down" method through the multi-variable regression modeling capabilities embedded in the EIS solution.

To ensure persistence of savings, the Company will follow appropriate monitoring guidelines and participants will be held to those requirements in return for eligibility toward incentives related to energy-efficiency activities pursued.

Along with identification of behavioral and low cost/no cost energy savings opportunities, the EIS program will identify and capture additional capital improvements, as well as identify demand management opportunities.

Program Changes

Some of the original 14 customers selected in 2016 will be coming to the end of their three-year participation period. The Company will be adding new customers to replace them.

Budget and Goal Considerations

The program's participation, energy savings goals, and budget were determined based on results from current EIS participants. There has been between 5 and 10 percent total kWh savings in the first full year of participation, then less savings in the subsequent years. The savings comprise of behavioral, low/no cost operational measures, and capital projects. The main budget drivers include the following:

- Administration: includes labor estimates which are based on historical spending.
- Third Party Customer Services: includes consulting services provided directly to the customer.
- Participant Incentives: based on historical spending from participants in the pilot offering.

Involvement in Community Energy Organizations

None.

Foodservice Equipment

Description
The Foodservice Equipment program offers prescriptive natural gas and electric rebates to business customers who purchase and install qualifying energy efficient foodservice equipment. The program aims to encourage customers to purchase higher efficiency foodservice equipment.

The program's main offerings include prescriptive rebates for the following:

- Gas Equipment
  - Broilers (char broilers, salamander, upright);
  - Demand controlled ventilation;
  - Dishwashers (gas water heating);
  - Fryers;
  - Ovens (combination, convection, conveyor, rotisserie, rotating rack);
  - Pasta cookers; and
  - Steam cookers.
- Electric Equipment
  - Demand controlled ventilation;
  - Dishwashers (electric water heating); and
  - Hot food holding cabinets.

Program Changes

Change	Rationale
Kitchen equipment lifetime increased to 12 years. Applied to convection ovens, conveyor ovens, combination ovens, rotisserie ovens, rotating rack ovens, fryers, broilers, char broilers, salamander broilers, and pasta cookers.	Review of lifetimes in various TRMs shows consensus that lifetime is now 12 years for cooking equipment.
Steam cookers have been added to the program's prescriptive gas offerings.	New research has emerged documenting their cost effectiveness.
Offering AC Rewards for Business.	As part of our strategy to increase participation in demand response programs. Further details on demand response measures are provided in the technical assumptions.

Budget and Goal Considerations
The saving levels were established using the latest Arkansas TRM and ENERGY STAR assumptions. Past participation levels were used to forecast participants.

The main budget drivers include the following:

- Administration – The budgets were based on historical performance.
- Advertising and Promotion – This budget provides funds to promote the program through customer and trade education and awareness through events and direct communication.
- Participant Incentives – The rebate budget reflects the current rebate levels and projected customer participation in each offering.

Involvement of Community Energy Organizations
None.

HVAC+R Solutions

Description

The HVAC+R Solutions program combines the Heating Efficiency, Motors & Drive Efficiency and Cooling Efficiency into one cohesive program. Refrigeration is also a new product that is now being offered as a part of this program. In total. the HVAC+R program combines all four products and technologies into one program that offers electric and gas rebates prescriptive and custom rebates to customers.

The first three products, Heating Efficiency, Motors & Drive Efficiency and Cooling Efficiency have been a part of the Company's portfolio in past plans. Refrigeration is a new product that expands the previous Commercial Refrigeration Efficiency (CRE) program. CRE was available to customers with annual usage of equal to or less than 400 kW per year. In HVAC+R, refrigeration will be available and promoted to all sizes of commercial and industrial customers that have refrigeration needs.

The HVAC+R Solutions program will allow for a more holistic approach to promote the upgrade or replacement of equipment as a system versus individual pieces of equipment since customers typically replace their heating and cooling systems at the same time. This change will also give the Company the flexibility to cross promote seasonal technologies, such as heating and cooling, as a year-round strategy. The motors and drives and refrigeration products offer customers opportunities to participate throughout the year and are not impacted by seasonality. An additional benefit of HVAC+R includes combining all offerings into one application for ease of use.

This program will be primarily marketed through our account managers and Energy Efficiency Specialists to large and mid-range customers. We will also work closely with our trade partners, specifically manufacturers' representatives, to market the program.

The program's main offerings include prescriptive and custom rebates. The prescriptive rebates are for equipment that exceeds the minimum efficiency as specified in the Minnesota Technical Reference Manual (TRM) for each technology. The main program offerings are outlined below.

- Heating – HVAC+R
  - New boilers, furnaces, water heaters and unit heaters that exceed the minimum efficiency required by the TRM;
  - Optional auxiliary boiler equipment that further improves a new or existing boiler's efficiency;
  - Distribution-system improvements, including steam trap repair, boiler tune-ups and replacement and pipe insulation;
  - Smart thermostats;
  - Linkage List Controls;
  - Ozone Laundry; and
  - High volume low speed (HVLS) fans.

- Motor and Drive – HVAC+R
  - Upgrade motors;
  - Induction and permanent magnet alternating current (PMAC) motors that meets or exceed the NEMA Premium efficiency energy standards for Motors;
  - HVAC and non-HVAC VFDs used to control the motor speed of fans and pumps;

- Water well pump VFDs used to control motor speed for water well pumping in specific applications; and
- Clean water pumps for industrial and commercial clean water pumping applications;
- Fan energy index.

- Cooling – HVAC+R
  - Cooling equipment that exceeds the minimum efficiency required by the TRM;
  - VFD retrofits on chillers;
  - Commercial AC Switch Single or Multi Stage; and
  - Smart thermostats.

- Refrigeration – HVAC+R
  - Refrigeration equipment that is typically found in grocery stores, restaurants, convenience or liquor stores;
    - The refrigeration measures will be moved from cooling and the measures will be detailed in the HVAC+R Solutions technical assumptions.

- Custom rebates are available for each technology for equipment that does not fall under the prescriptive portion of the program.

Additionally, the Company will offer in-depth study funding of up to 75 percent of the study cost, not to exceed $25,000, to identify and quantify energy savings of the HVAC+R projects.

Refrigeration assessments will also be available at no cost customers to eliminate a barrier in participating in the program by having to justify or find funding for an assessment. By removing this barrier, customers can focus on using these dollars to make improvements to their refrigeration systems and processes. The assessments will be performed by professionals that specialize in energy efficiency or refrigeration. These professionals are trained to identify energy savings opportunities for a customer's refrigeration and related HVAC equipment and systems. These professionals will also work with customers to assist them in the implementation of the changes identified in their assessments.

Prescriptive rebates:
By combining the four separate products or technologies into one program, HVAC+R will reduce many of the market barriers that customers may have to participate in multiple programs as the program is now being offered as a bundled program. Even with the new program structure, it will still be challenging to reach smaller typically non-managed or non-participating customers and will require additional promotion strategies, especially for the refrigeration product.

Custom rebates:

- Custom rebates for energy saving HVAC+R projects that do not fall within the requirements of the prescriptive rebates. Custom applications will be analyzed and are required to meet cost effectiveness parameters.

Program Changes
The following table summarizes changes to the program in this Plan.

Change	Rationale
Creation of the Refrigeration – HVAC+R	To allow customers of all sizes participate in the refrigeration measures.
Moving CRE measures to Refrigeration – HVAC+R	Moving the measures under CRE to Refrigeration will make these measures cost-effective as well as allow customers of all sizes to participate in them. Along with being able to promote these measures with the other refrigeration measures as a more cohesive product / technology.
Refrigeration – HVAC+R assessment structure change	Moving to an engineering firm that specializes in refrigeration assessments and project implementation.
Measures under Heating Efficiency are now moving to HVAC+R	Offering customers a bundled program for ease of use.
Measure moved from custom to prescriptive	Linkage List Controls this change is intended to make it easier for customers and trade partners to participate in the program.
Measures under Motors & Drive Efficiency are now moving to HVAC+R	Offering customers a bundled program for ease of use.
Measures under Cooling Efficiency are now moving to HVAC+R	Offering customers a bundled program for ease of use.
New measures have been added to technology and are detailed in the technical assumptions for HVAC+R	Moving measures from custom to prescriptive for to make it easier for customers and trade partners to participate in the program.
Incremental costs for HVAC and non-HVAC VFDs are changing	Updated cost information has become available for this equipment.
Incremental costs for water well pump VFDs are changing	Updated cost information has become available for this equipment.
RTU Economizer Control with Demand Control Ventilation	Moving to Efficiency Controls.
Demand Control Ventilation	Moving to Efficiency Controls.
EC fan motor commercial furnace – new or retrofit	Retiring this measure as it is now code for commercial furnaces manufactured as of December 31, 2019.
Constant Speed Motor Controllers (CSMC)s	Retiring this measure due to lack of customer participation.
Enhanced New Motors	Combing this measure with Enhanced Upgrade Motors into one measure – Enhanced Motors.
Enhanced Upgrade Motors	Combing this measure with the Enhanced New Motors into one measure – Enhanced Motors. Will be using the efficiency levels of the New Enhanced Motors for this new measure.
The rebates for the upgrade and Enhanced motor measures are dropping by 50 percent	The rebates for these measures are not as cost affective as the other measures within the program.
The rebates for water well pump VFDs are dropping by 50 percent	The rebates for these measures are not as cost affective as the HVAC and non-HVAC VFDs.

Update custom rebate offer	To place more value on energy savings that occurs during peak coincident periods.
Name change of Engineering Assistance Studies	In order to provide a clearer name for our customers in conjunction with this new set of assessments, Engineering Assistance Studies will change names to In-Depth Studies, indicating that these are the most detailed assessments available.
Adding Demand Management measures	As part of our strategy to increase participation in demand response programs, this program will be offering Saver's Switch for Business and AC Rewards for Business. Further details on these measures are provided in the technical assumptions.

Budget and Goal Considerations
The program's participation, energy savings goals, and budgets were determined by looking at the historical electric goals and historical participation levels for each of the previous four programs. Our analysis included the review of equipment and characteristics of historical projects to develop a projected average savings per participant for various custom program offerings.

The main budget drivers include the following:

- Participant Incentives – The budget reflects rebates to help offset initial costs associated with the capital investment in energy efficient equipment
- Administration – These budgets are based on past program performance with a slight increase built in for expanded program offerings, engineering and participation.
- Advertising and Promotion – The promotional budget was derived using historical data from past activities. Promotions are targeted to customers and typically focus around activities such as new or revised product offerings, targeted promotions such as seasonality measures for heating or cooling or benefits of one of the four technologies or information regarding bonus rebates and or program or policy changes.
- Customer Service – The Company employs consulting and analytical services for custom projects that are analyzed through the Custom Efficiency program, as well as for engineering studies.
- Rebates - were developed to reflect the associated energy savings for each measure.

Involvement of Community Energy Organizations
The HVAC+R program works with multiple community, energy organizations and trade vendors, distributors and installers. This is done by hosting training sessions for both customers and trade partners. We also participate regularly with the following organizations:
- The Minnesota Blue Flame Association is used to drive awareness of natural gas conservation topics and increase educational resources for energy savings options;
- Minnesota ASHRAE Chapter and host trade partner training events to further local industries understanding of cooling and energy efficiency programs;
- Motors Decisions Matter (MDM) is a national awareness campaign that promotes effective motor management and informed on the latest energy efficiency technologies for motors and motor related equipment; and

- Refrigeration is a very specialized technology and will be partnering with Minnesota Heating & Cooling Association and Industrial Refrigeration Consortium.

We meet frequently with these trade organizations to assess engagement, program strengths and weaknesses, as well as to get feedback on the market for all technologies. Each technology within the program can be complex and trade support is crucial to achieving our goals. We actively engage with trade organizations and local trade partners in program design and project implementation when applicable.

Lighting

Description
The Lighting program offers LED rebates to Xcel Energy electric business customers that install qualifying energy efficient lighting equipment or lamps in existing or new buildings. We work closely with our trade partners, manufacturers' representatives, distributors, and contractors to market the program. The program is marketed predominantly to large business customers through our account managers and to medium-sized customers through the Business Solutions Center.

The program's main offerings include the following:

- Prescriptive rebates for LED retrofits to help offset the cost of installing new lighting equipment. Rebates are available for customers of any size and qualifying equipment must be more efficient than what is currently installed.
- New Construction rebates on qualifying lighting equipment for facilities that are newly constructed or undergoing major renovations. The equipment must be more efficient than standard equipment that meets baseline codes.
- Custom rebates for energy saving lighting projects that do not fall within the requirements of the prescriptive rebates. Custom applications will be analyzed and are required to meet cost effectiveness parameters.
- LED Instant Rebates offers discounts on LED lamps that are purchased for existing or new construction facilities.
- Redesign Studies are available for customers needing assistance in determining optimum lighting levels for their facilities. Certified Lighting Professionals or a member of the International Association of Lighting Designers work with customers to identify and quantify lighting solutions that include energy saving opportunities. Implementation rebates are available to customers who proceed with recommendations from the study and install energy efficient lighting equipment.

Program Changes
The following table summarizes changes to the program in this Plan.

Change	Rationale
Elimination of traffic signal lights	The market has been transformed.
Reduction of rebates for selected high bay fixtures and retrofit kits.	Incremental cost for equipment has decreased.

Budget and Goal Considerations
The product's participation and energy savings targets were determined by looking at historical participation levels, as well as the large number of LED products that are expected to be commercially available during the time period of this Plan. Previous project characteristics, including equipment type/mix, were also used to develop projected average dollars-per-kWh rebate for each measure.

Budgets

Historical expenditures were analyzed to project the budget. Below are the main drivers of the budget.

- Participant rebates make up most of the program budget. This budget reflects the rebate levels and projected customer participation in each measure, which was based on historical participation across the offerings.
- The administration budget is based on past product performance with a slight increase built in for expanded product offerings, engineering, and account management involvement.
- A promotional budget was developed based on expected expenditures to drive the market to energy efficient equipment. Promotions are targeted to customers and trade partners and typically focus around activities such as new or revised product offerings, case studies featuring successful projects, educational opportunities such as events, and bonus rebates.

Involvement of Community Energy Organizations

None.

Multi-Family Building Efficiency

Description
The Multi-Family Building Efficiency (MFBE) program is a joint offering with CenterPoint Energy that provides a streamlined approach to whole-building energy savings in 5+ unit multifamily properties. Offered through one program implementer, it is designed to engage building owners by helping them understand their energy use, achieve immediate energy savings through low-cost improvements, and move beyond the initial measures for whole-building energy savings. The structure is a combined approach of a whole-building energy audit with a direct-install phase to engage the building owners and achieve early savings, and a performance-based component to encourage further improvements in the building, then assistance to begin benchmarking their building.

In the 2020 Extension Plan filing, changes were made to the original program design to address challenges identified through a program evaluation conducted in 2018 and input from various stakeholders and participants. The program provides rebates with a bonus incentive when energy-saving measures are implemented, providing the customer an incentive that is above the utility's standard rebate offerings. Energy-saving opportunities will be unique to the building(s) and can be in common areas or residents' units. The program is marketed to building owners/managers and is available to both market rate and affordable housing properties.

The program's main offerings include the following:

- Whole-building energy audit and direct install of low-cost energy savings measures;
- Project consultation;
- Rebates and bonus incentives for energy saving upgrades; and,
- Assistance to begin benchmarking.

The main offerings are described in further detail below.

<u>Whole-building energy audit and direct install of low-cost energy savings measures</u>
The MFBE program target is 5+ unit building owners/managers, or those who can make decisions and implement energy efficient improvements in the whole building. Eligible properties must have Xcel Energy as their electric service provider and either CenterPoint Energy or Xcel Energy as their natural gas provider. The 5+ unit multifamily building must also have a common entrance, common space(s) and in-unit kitchens to qualify for participation in the program. The determination of whether a property is eligible to participate is reviewed on a case-by-case basis.

To encourage engagement, the program starts with a free whole-building energy audit and the direct install of energy saving measures, with all services being provided by one third-party program implementer. After completion of the energy audit and direct installations, a written report identifying the building's baseline energy use, the audit findings and recommended energy savings opportunities that could receive a rebate and incentive is provided to the building owner/manager.

Direct install measures include:

- In unit LEDs;
- Common area screw-in LEDs;

- Smart Power Strips;
- Water Heater Set-back;
- Kitchen and bath faucet aerators;
- Energy efficient showerheads; and,
- Exterior door weather stripping.

We will continue to offer limited quantities of Renter's Kits for individual renters whose property owners/managers choose not to participate in the program, and consequently the renter did not receive the direct install measures in their individual unit. Since the Renter's Kits energy savings measures are limited to the individual unit, the kits alone do not provide the robust program benefits to the multi-family property and are therefore intended as a stop-gap measure to aid individual renters. The hope is that the renter can encourage their property owner/manager to participate in the program and receive the full array of benefits offered through the program to the whole building. Materials and resources are available to aid renters in communicating the program to their property owner/manager.

Project consultation
The building owner/manager works with the program implementer to determine the energy improvements preferred for implementation from the audit report. The program implementer will provide review and oversight of equipment efficiency specifications oversee QA/QC to ensure improvements are performed as specified and assists with the rebate and incentive submission.

Rebates and bonus incentives for energy savings upgrades
Participants moving beyond the assessment and direct-install phase of the program and choosing to undertake energy efficiency upgrades are eligible for rebates with a program bonus incentive equal to 30 percent of rebate value for work completed.

Buildings qualifying as low-income (based on the August 2012 guidance document from the Department of Commerce, Division of Energy Resources) are eligible for doubled bonus incentives (60 percent of the rebate value). Although the MFBE program is not a dedicated low-income program, the use of this program adds additional value for these customers and the associated program costs for low-income buildings (including incentive spending and project delivery expenses) may be used for purposes of demonstrating compliance with the statutory low-income spending requirement.

As part of our strategy to increase multi-family building participation in demand response programs, this program will be offering AC Rewards for Business. Further details on demand response measures are provided in the technical assumptions.

Program Changes
The following table summarizes changes to the program in this Plan.

Change	Rationale
Offer AC Rewards for Business as an option for the common space areas with the appropriate cooling units	To increase multi-family building participation in demand response programs.
Add Exterior Door Weather stripping	This measure was not included for electrically heated

for electric heated buildings	buildings in the 2020 Extension filing. This change is intended to provide this measure to all buildings.

Budget and Goal Considerations
The program's participation goals increase each year. This is expected to drive increases in the total number of direct install measures installed. It is also anticipated that carryover projects from the original program design will be completed in addition to the prescriptive measure projects with rebates and bonus incentives paid.

The main budget drivers include the following:

- Administration – This budget covers internal labor and expenses for program planning, promotion, implementation and vendor administration.
- Rebates – This budget covers the direct install measure costs, rebates and bonus incentives paid when energy efficient upgrades are achieved.

Involvement of Community Energy Organizations
We are participating in the Minnesota Multifamily Affordable Housing Energy Network, which consists of various community stakeholders and initiated by Fresh Energy, Minnesota Housing, Natural Resources Defense Council and the National Housing Trust. We are also members of a national ACEEE working group focused on energy efficiency in multifamily properties.

Process Efficiency

Description
The Process Efficiency program is a strategic energy management approach to creating persistent savings and continuous improvement. In addition, to capital equipment improvements for energy efficiency and demand response opportunities, the program also stresses system-level operational change as well as cultural change with customers' senior management, mid-management and other personnel. Targeted towards large to mid-sized industrial customers that have at least 0.3 GWh or 2,000 Dth of conservation potential., these customized resources work to develop a holistic, sustainable energy management plan. This program provides funding for studies to identify and scope energy efficiency opportunities. Rebates are available to customers who implement qualifying energy efficiency recommendations. This program is primarily marketed to industrial customers through the Company's account managers.

Offering
The program offerings are delivered in multiple phases. Each phase is defined in a Memorandum of Understanding (MOU) that is customized to reflect the needs of each specific customer. Typical phases are listed below.

Phase 1: Identification
Xcel Energy performs a high-level analysis to identify opportunities for energy savings in the customer's business practices, facilities, and operations. This is completed at no cost to the customer. Phase 1 is delivered using a third-party provider selected through a Request for Proposal (RFP) process.

Phase 2: Scoping
This phase provides support and resources to further define, measure, and provide recommendations and assistance for energy savings opportunities while working with the customer to optimize the business practices identified in Phase 1. Total funding for Phase 2 is based on estimated savings and a typical customer is asked to contribute up to 25 percent with a maximum amount of $7,500 or an equivalent investment or commitment. The purpose of the customer contribution is to ensure management-level engagement and the customer's commitment to a holistic approach. Phase 2 is delivered using internal resources and/or third-party technical experts selected through an RFP process, or through technology-specific experts of the customer's choosing.

Phase 3: Implementation Plan
Xcel Energy works with the customer to put together an energy management plan which includes conservation goals as well as energy conservation and demand reduction projects. This phase includes a customized rebate and bonus schedule that rewards deep savings and/or a system-wide approach.

Upon project completion, customers receive rebates for improvements that qualify for any of our prescriptive or custom programs. The savings are included in the Process Efficiency program achievements but mirror the rules and rebate levels of our other programs. If the improvements do not qualify for rebates due to program rules, we claim the project savings in a manner consistent with our study driven credit policy.

Phase 4: Energy Performance Indicator Services

Phase 4 is an option for customers who are interested in ongoing commissioning and/or continuous improvement. Specifically, this phase provides consulting services that support the customer through the process of installation, integration, and commissioning of energy information systems to demonstrate repeated and consistent improvements in energy usage. These services are offered to develop a baseline energy model and measurement and verification of energy savings due to behavior change and low-cost/no cost operational improvements. This offering can be done in conjunction with the Phase 2 offering or later in the engagement process.

Policies

Due to the holistic nature of this program, several policies have been previously filed and approved by the Department and continue to remain in effect:

- Bundling: When customers identify multiple measures for installation, a bundle can be evaluated to see if it qualifies for a rebate versus each individual component. This allows measures with too short of a payback for a rebate to be leveraged to drive projects with too long a payback for the customer to install so that both are implemented.
- Preapproval: Custom-type measures in Process Efficiency require a custom analysis, but the actual date the project is submitted does not disqualify a project if it was initiated after the customer entered the program. This is due to the extensive resources used by the program to identify and scope ways to drive energy efficiency into how a customer does business. The goals and awareness created during Phases 1 and 2 can result in projects that drive energy savings in business areas that act without immediately notifying the personnel in contact with Xcel Energy.
- Rebate bonuses: We will use the rebate structure of the other end-use programs and then incorporate additional rebate bonuses for system optimization and/or exceeding annual achievement targets.
- Facility-level metering: We have worked in advance with the Department to define the methodology of how we to take credit under this metering scenario. Facility-level metering provides us the ability to accurately account for all savings generated by installation of a measure and incorporate the savings that may be driven plant-wide that we have been unable to accurately capture historically.
- Behavioral savings: We use the Department's Average Savings Method to count behavioral savings created through single entity-based behavioral change efforts. This also could apply to technical projects that require specific behaviors to maintain persistent energy savings throughout their lifetime.

Program Changes

The Company will make the following program changes in this Plan.

Change	Rationale
Generic load shapes for custom projects will no longer be used. Project specific load shapes will be used to determine marginal energy benefits.	The reason for this change is to ensure higher accuracy of the marginal benefits that a project will provide. It will more accurately take into account the seasonal and hourly variation of the energy savings.
This program will offer Saver's Switch for Business, Peak Partner Rewards, Interruptible	To increase participation in the Company's demand response programs. Further details on

Rates and AC Rewards for Business.	Demand response measures are provided in the technical assumptions.

Budget and Goal Considerations
We determined the program's participation, energy savings goals, and budgets by examining historic participation levels, project and participation cycles, and costs.

The main budget drivers include the following:

- Administration – These costs are driven by marketing, sales, engineering, and external labor resources to support the Company's heavy engagement with the customer, as well as cover the costs of those projects requiring metered verification.
- Customer Service – The Company utilizes third-party resources to deliver the program's identification and scoping phases.
- Participant Incentives – The program has a robust rebate budget due to the size of projects likely to be initiated through the Process Efficiency program. In addition to standard rebates, Process Efficiency offers lucrative bonus rebates for exceeding energy savings and/or implementing projects on a system-wide approach.

Involvement of Community Energy Organizations
The Process Efficiency program works with Community Energy Organizations to promote the program and deliver its offerings. In particular, the Trillion BTU financing delivered by the St. Paul Port Authority can help customers fund large capital projects when financing is a barrier to implementation. We consider leveraging resources as they become available through these and other external organizations and consider integrating their offerings into our program and our customers' energy management plans.

Self-Direct

Description
The Self-Direct program provides our larger electricity and natural gas business customers with the opportunity to self-manage their energy saving projects. For their efforts in assuming this responsibility, we offer higher rebates whose dollar value is based on the amount of energy savings achieved. Participants must have the ability to perform the project design, conduct engineering review, analyze their measurement and verification (M&V) results, commission their work, and validate and report the associated energy savings for any projects included in this program.

This program is targeted toward self-sufficient customers with an interest and capability to oversee their own energy efficiency improvement projects, as opposed to those who desire full-service via holistic products like Process Efficiency. The program gives self-sufficient retailers and public service providers, larger property management companies, manufacturers, and multi-national corporations the opportunity to plan efficiency around their business model.

Customer eligibility requirements include a minimum aggregated monthly peak load of at least 2 MW and/or an aggregated annual energy usage of at least 10 GWh and/or 100,000 Dth. Customers may bundle multiple projects in their energy management plan to meet the eligibility requirements. Qualified customers will identify their energy savings initiatives and submit an application, proposed energy saving plan, monitoring plan, and pre-project energy usage data to the Company for review and preapproval. We will issue a preapproval receipt with their rebate offer.

After the project is fully installed and operational, customers must submit their project completion documents, which includes the application, final report, and monitoring results, for review. The Company will issue final approval and a rebate check based on the achieved savings. The Company reserves the right to request additional information and make amendments regarding the project scope and expectations, as warranted, with the objective of understanding and coming to a mutual agreement.

Qualified customers will be allowed to participate in other CIP programs offered by the Company, but will not be eligible for a rebate for the same efficiency measure through another program. Finally, customers with new construction projects are not eligible to participate in Self-Direct, but instead will be directed to our Business New Construction program.

Program Changes
None.

Budget and Goal Considerations
The anticipated sales cycle from project initiation to completion is about 18 to 24 months, and it represents a risk of stranded investments to the Company if a customer withdraws before completing their project. We will mitigate this risk by monitoring the customer's commitment throughout the process.

- Administration – This budget includes the costs of internal labor which were estimated using historical spending.
- Participant Incentives – The rebate budget is the main budget driver for this program.

Involvement of Community Energy Organizations

We anticipate some customers will hire local consulting engineering companies to help design and manage their projects, and we also anticipate customers in area energy initiatives will also be involved.

Electric Rate Savings

Description
The Electric Rate Savings program is offered to any business customer that reduce their electric loads during control periods by at least 50 kW. In return for reducing their loads, they receive a monthly discount on their demand charges. Participants save as much as 50 percent on demand charges over the year. The Electric Rate Savings program is promoted directly through Xcel Energy's account management and Business Solutions Center team.

Program Changes
As part of our strategy to increase participation in demand response programs, this program will be offered in direct partnership with several energy efficiency programs. Further details on Demand Response measures are provided in the technical assumptions. As a result, the budget for the program will remain steady to maintain participation levels.

Budget and Goal Considerations
The program's participation, energy savings goals and budgets were estimated using historical program performance and emerging market influences. The budget for this program includes labor costs for associated services and vendor services for maintaining the customer notification system, with the remaining costs attributed to customer communications.

Every year a program information packet is sent to each participating customer, explaining any program changes, reminders of their responsibility as an interruptible customer on a control day, and historical information. Due to the possibility of year-round controls within Midcontinent Independent System Operator's (MISO) as well as a required real power test event each year, it is crucial that the customer notification system be maintained to ensure customers are contacted during an event.

The main components of the program budget include:

- Administration – This category includes labor costs for internal sales, sales support and fulfillment, marketing administration and planning, equipment installation and maintenance, project planning and implementation.
- Contract Outside Vendor – Administrative costs for third party implementer for the development and maintenance of the customer notification system.
- Advertising and Promotion – We have budgeted to conduct an annual customer mailing, test event mailings, customer town meetings, and program collateral materials.

Involvement of Community Energy Organizations
None.

Peak Partner Rewards

Description
The Peak Partner Rewards program is offered to any business customer that can reduce their electric loads during control periods by at least 25 kW between June and September. With Peak Partner Rewards, customers can receive credits on electric bills for agreeing to reduce electric usage during periods of peak energy demand, such as hot summer days. Customers will receive additional bill credits when they reduce their electric usage by their agreed upon amount or more during control periods. The Peak Partner Rewards program is promoted directly through Xcel Energy's account management and Business Solutions Center team.

Program Changes
Peak Partner Rewards was approved in November 2019 and launched in March of 2020. No major changes have been made to the program since the 2020 CIP Extension Plan filing. However, as part of our strategy to increase participation in demand response programs, this program will be offered in direct partnership with several energy efficiency programs. Further details on demand response measures are provided in the technical assumptions.

Budget and Goal Considerations
The program's participation, energy savings goals, and budget were developed based on the Company's ongoing experience with a Peak Partner Rewards program in its Colorado service territory. The main budget drivers include the following:

- Rebates – This category includes the Reservation and Performance Incentives paid to participating customers.
- Administration – This category covers costs associated with day-to day operations of the program as well as consulting from Company staff to assist customers in identifying controllable loads and an appropriate load reduction value.
- Equipment & Installation – This category reflects the cost to purchase and install monitoring equipment at each participant's facility. Expenditure is expected to be greatest in the early years of the program as the participant base is built. Future expenditures will reflect costs of growing the program incrementally and any ongoing equipment maintenance for current participants.
- Promotion and Advertising – Marketing and communication materials are created to communicate the features and benefits of the program. These marketing materials include a program guide summarizing key features and benefits and a Peak Partner Rewards website accessible on the Company's website to provide more extensive program information. Additionally, the Company will utilize its program management, account management, and Business Solutions Center teams to recruit customers. However, budget has been included for a third-party recruitment vendor to assist with these efforts if needed.

Involvement of Community Energy Organizations
None.

Commercial AC Control

Description
Commercial AC Control is a program that aims to manage system load by modifying customer air conditioning load during times of hot weather. There are two offerings included in the program: Saver's Switch for Business and AC Rewards for Business. Both products provide simple demand management solutions that are more accessible to small commercial customers than the Company's larger performance-based demand response programs.

Saver's Switch for Business is a load management program available to business electric customers with central air conditioning. Participating customers receive a monthly discount on their June through September bills. In exchange for the discounts, participants allow Xcel Energy to cycle their air conditioner on and off during control events, which typically occur on hot, humid summer days. Air conditioners are controlled via a radio operated switch installed by a licensed electrician on or near the customer's air conditioner. The switches utilize an adaptive algorithm designed to ensure a 50 percent reduction in air conditioner load during a control event. In the past decade, the company has issued relatively few control events. The tariff allows for up to 300 control hours each year.

AC Rewards for Business consists of thermostat-controlled demand response measures. This product will capture the dispatchable demand savings associated with smart thermostats while the related energy efficiency savings will also be captured through new measures within the product.
The smart thermostat demand response measures will be offered through a new direct install channel in addition to leveraging existing direct-installation channels. Customers will receive a free thermostat installation and be enrolled in the Company's demand response program. Customers will also receive a recurring prescriptive incentive in the form of a bill credit for remaining enrolled in the program.

Program Changes
With the potential for deploying a new advanced meter reading system in Minnesota, the Company aims to test a new two-way communicating Saver's Switch. The goals of the new switch is to improve the signal reception rate over the current paging base technology and improve visibility of failing switches in the field.

Budget and Goal Considerations
The program budget and savings were developed based on equipment and installation costs for the number of switches to be installed and replaced. During this Plan, in addition to recruiting new participants, the Company intends to replace Saver's Switches older than 15 years. We also will conduct inspections of additional older switches to verify functionality and, if needed, replace with new hardware. The overall participant target is met with a combination of new installations and maintenance replacements.

The main budget drivers include the following:

- Administration – This budget category covers the costs of internal labor for program planning and implementation, as well as the costs of external contract labor and software maintenance.
- Customer Service – The program uses a third-party to install the switches.
- Advertising and Promotion to generate awareness of Saver's Switch for Business.

- Measurement and Verification – The program hires a third-party to conduct data collection for measurement and verification to determine the savings per switch.

Involvement of Community Energy Organizations
None.

Business Education

Description
The Business Education program focuses on creating awareness of energy efficiency and providing business customers with information about what they can do to reduce energy use in their buildings. The program encourages customers to make Xcel Energy their first contact when considering equipment or process upgrades and engages customers to make changes that lower their energy use. It focuses on removing the barriers to adoption of energy efficiency measures by educating customers and their employees on the impacts of their energy use and offering information on how to take action to achieve long-term energy savings.

The program is primarily marketed to small and mid-sized business customers through sponsorships, customer outreach and advertising campaigns. The program's main offerings include the following:

- Sponsorship and customer outreach; and
- Digital communications.

The Business Education program targets a variety of community events, sponsorships, workshops and business expos to promote energy efficiency rebates and energy conservation strategies to a wide range of business customers. These opportunities allow for in-person, one-on-one customer outreach which is critical to driving onsite customer leads and program signups.

Program Changes
None.

Budget and Goal Considerations
The program's participation goals and budgets were determined by estimating educational material requests, community outreach events and sponsorships.

The main budget drivers include the following:

- Administration – This category represents the labor needed for program planning and implementation.
- Advertising and Promotion – This budget includes funds for printed materials, community outreach events, sponsorships, and digital advertising.

Involvement of Community Energy Organizations
The Business Education program participates in a variety of community-hosted customer outreach events. The program provides displays, staffing, and materials to promote energy conservation and efficiency to attendees.

Energy Benchmarking

Description
The Energy Benchmarking program offers a streamlined and consistent approach to access aggregated whole building energy data. The service relies upon the U.S. Environmental Protection Agency's ENERGY STAR Portfolio Manager (ESPM) to assist customers in benchmarking their buildings.

The program is primarily marketed to those customers falling under a municipal benchmarking ordinance, such as Minneapolis' Commercial Building Energy Benchmarking and Transparency ordinance. This ordinance currently covers commercial and multifamily buildings 50,000 square feet and greater. Several other cities are launching similar pilot ordinances. As a result, the Company expects program participation to expand continually over the next several years.

The Company participated in a U.S. Department of Energy (DOE) effort under the Better Buildings Initiative called "Energy Data Accelerator," which is designed to bring utilities and municipal leaders together to "demonstrate streamlined, best-practice approaches for building owners to access whole-building energy usage data—with a specific focus on providing building owners with aggregated energy usage information across multiple tenants." The Company gained valuable insights from both its municipal partner, the City of Minneapolis, as well as from DOE Facilitators and Utility collaborators across the country. The design implemented by the Company is a product of these accumulated insights and is representative of best practices identified through this effort.

Key features of the Energy Benchmarking program include: Building Owner Authorization, Tenant Identification, Data Privacy Rule Implementation, Consumption and Cost Data Aggregation and Normalization, and Automated Data Transfer to the ESPM. Each of these elements is discussed in more detail below.

- **Building Owner Authorization**
  - Upon registration to an online portal, building owners or their contracted agents will be verified using publicly available records as well as information available within the Company's Customer Information System
- **Tenant Identification**
  - Using the property address, the Company will return a list of tenants' premises that appear to be associated with the building. If verified as accurate by the building owner, this list will be used to permanently associate those premises to the property in the Company's customer information systems.
- **Data Privacy Rule Implementation**
  - The system is designed to implement thresholds based on either the tenant count, individual tenant usage percentage, or both. Currently there must be 4 tenants or more aggregated with no individual using more than 50 percent of the aggregated total consumption. No energy data will be shared with the building owner or agents until these rules have been satisfied.
- **Consumption and Cost Data Aggregation and Normalization**
  - Acknowledging that most building owners seek whole-building aggregate data, the Company will automatically combine data across meter readings and normalize those

readings to a common calendar month cycle. Building owners will also can request data for individual tenants, or sub-sets of tenants as desired; however, these requests will be subject to aggregation methodologies outlined in Rule 3034 and will be more likely to require individual tenant consent.

- **Automated Data Transfer to ENERGY STAR Portfolio Manager (ESPM)**
  - The service relies upon ESPM to standardize the transfer of energy data from the Company's systems. This decision was made primarily from the fact that ESPM is well-established as the industry standard tool to perform energy benchmarking, and that this standard further allows a consistent, free, robust option for building owners to gain valuable information about their buildings.

The Energy Benchmarking program also supports the Company's Community Energy Reports offering, which produces publicly available city, county, and state level energy consumption, CO2 emissions, and renewable program participation data on an annual basis.

Program Changes
No changes to the operation of the program. The software is going through an upgrade project starting in 2020 and expected to be in place early 2021. At the same time, an expansion of the program to support Minneapolis' Time of Rent ordinance will also be occurring. This will allow prospective residential tenants to view an estimated utility bill prior to signing a lease.

Budget and Goal Considerations
The Benchmarking program's participation and budgets were determined by current participation rates of buildings under a benchmarking ordinance, future ordinances recently implemented or anticipated to be implemented, and the labor associated with setting up a new building. The main budget drivers include the following:

- Labor – Building set up and customer service.
- Ongoing software upgrades and maintenance.

Involvement in Community Energy Organizations
The Energy Benchmarking Program Team works directly with several community energy organizations to promote and educate customers on the program.

Small Business Lamp Recycling

Description
The Small Business Lamp Recycling program encourages electric customers in Minnesota to recycle their spent fluorescent bulbs instead of discarding them to ensure that mercury does not get into the environment.

The program's main offerings include the following:

- Free compact fluorescent light (CFL) bulb recycling at participating local hardware stores and partnering county hazardous waste facilities; and
- Coupons for 50¢ off the recycling fee for each fluorescent tube and HID bulb. The coupons are available at participating hardware stores and on the Company's website.

The Small Business Lamp Recycling Program is marketed primarily through Xcel Energy's Home Lighting program promotions, participating hardware stores, and on the Xcel Energy website. A search feature allows customers to search by zip code to find the nearest recycling locations.

The Company follows the requirements of Minn. Stat. 216B.241, subd 5, which necessitates public utilities to notify customers that fluorescent recycling is the law in Minnesota. Every Small Business Lamp Recycling and Home Lighting promotional piece includes a disclaimer regarding the statute, such as, "Fluorescent lamps contain small amounts of mercury that are harmful to the environment. In Minnesota, it is illegal to dispose of spent mercury bulbs in household trash receptacles."

Program Changes
None.

Budget and Goal Considerations
The budget was developed based on historical spending and the expected number of bulbs to be recycled in the coming years. The budget is set to decrease annually due to an anticipated decline of bulbs recycled each year. The promotional budget will remain consistent throughout this Plan.

The main budget drivers include the following:

- Administration – This provides funds for internal labor and program implementation.
- Promotion and Advertising – We market this program with Home Lighting program promotions.

Involvement of Community Energy Organizations
None.

Residential Segment

Description
The Residential Segment reflects a diverse population across electric and natural gas customers. In this Plan, the Residential portfolio will offer a comprehensive set of programs including prescriptive rebates for equipment, whole home solutions for new and existing homes, demand response and educational offerings.

Programs
The Residential Segment proposes numerous program offerings for this Plan, including direct impact programs and indirect programs in which customers can choose to participate. We will continue to offer all programs from the 2020 program year.

Overall Goals
The Residential Segment portfolio is designed to provide all residential customers with an opportunity to participate. The Company anticipates most energy savings within the Residential Segment will come from several key programs over the next three-year period, including: Home Lighting, Home Energy Insights (formerly Energy Feedback), and Residential Heating and Cooling. The following table presents the Company's goals for 2021-2023:

Electric					Gas		
Plan Year	**Participation**	**Budget**	**Gen kW**	**Gen kWh**	**Participation**	**Budget**	**Dth**
2021	1,593,364	$28,190,267	62,895	213,826,635	616,392	$7,957,269	402,608
2022	1,560,994	$28,928,943	64,099	212,256,325	617,384	$8,223,607	421,419
2023	1,545,554	$29,438,210	65,112	207,691,151	615,460	$8,555,887	438,045

Market Analysis
A strong economy was considered when determining program savings plans and consumers' ability and willingness to invest in higher efficiency equipment and invest in whole-home solutions.

Marketing/Advertising/Promotion
The Company relies heavily on trade allies, end-use equipment vendors, and our call center representatives to drive energy efficiency and demand response participation in the Residential Segment. To support our marketing efforts, we will employ an integrated approach to communications with tactics reinforcing the key messages over time. Those key messages include our clean energy commitment, reduced energy consumption, lower utility bills, and environmental impact. A strategic plan for mass market advertising and promotions including event planning will help us to reach our customers and to encourage program participation.

Overall Policies
The Residential Segment does not have any unique, segment-based policies. Each program will enforce its participation and equipment eligibility rules and requirements; however, they may be modified when warranted and within guidance outlined by the Minnesota Department of Commerce.

Involvement with Interested Individuals and Entities

The Company continues to regularly meet with many organizations to refine our existing programs, shape new programs, and discuss partnership opportunities. These organizations include but are not limited to, other utilities and industry experts such as:

- Center for Energy and Environment;
- CenterPoint Energy;
- Fresh Energy
- Great River Energy;
- Minnesota Energy Resources Corporation;
- American Council for an Energy Efficient Economy;
- U.S. Department of Energy
- Consortium for Energy Efficiency;
- Slipstream; and
- Air Conditioning Contractors Association.

Efficient New Home Construction

Description
The Efficient New Home Construction program encourages home builders to construct energy efficient residential homes by providing incentives for achieving total energy savings of at least 10 percent better than code. This program applies to builders of residential single-family, duplex, triplex, fourplex, town homes, and condominium units that have individual heating systems and residential meters for Xcel Energy gas and/or electric service. We use a third-party implementer to recruit raters and to provide product training for raters and builders. The third-party implementer is responsible for collecting and reviewing building information from the raters and providing information to Xcel Energy for use in determining savings. Builders hire their own RESNET-certified house raters who coordinate with their own RESNET providers.

The program's main offerings include the following:

- Builder rebates for Xcel Energy heating homes achieving a total energy savings level of at least 10% above the level established by code;
- Builder rebates for electric homes achieving a total energy savings level of at least 10% above the level established by code;
- Appliance rebates for qualifying homes with Xcel Energy electric service;
- Rater incentives

The main offerings are described in further detail below.

Xcel Energy Heating Customers
Homes must test out at a minimum of 10 percent total energy savings above code and must have positive heating energy savings. Homes not reaching that minimum are not eligible to participate and no incentives or payments to the builder or the rater will be available.

Xcel Energy Electric Homes
For homes built in our electric-only service territory that are not Xcel Energy heating customers, the builder receives a $100 rebate when the home achieves the minimum 10 percent total energy savings above code and has positive kWh savings.

Appliance rebates
The following appliances are eligible for rebates in homes that successfully participate in either of the offers above and where Xcel Energy is the electric provider:

- ENERGY STAR® rated clothes washer;
- ENERGY STAR rated radon mitigation fans;
- ENERGY STAR rated refrigerators;
- Communicating heat pump water heaters; and
- AC Rewards eligible thermostats.

Rater Incentive
An incentive is paid to raters for each home they submit to the program. This incentive recognizes the additional work required for data collection and entry.

Program Changes
The following table summarizes the proposed program changes made for this Plan. Xcel Energy will monitor technological innovations in building practice and energy modeling and modify program features accordingly.

Change	Rationale
Add a pathway for homes that space condition with high efficiency electric equipment	Evidence from the field that this is a nascent but growing choice for some builders.
Add AC Rewards-eligible Thermostat incentive	Increase participation with the Company's demand response offerings.
Add an incentive for communicating water heaters	Increase the deployment of energy saving and demand response enabled water heaters, the latter of which cannot be modeled in software.
Add an incentive for installing AC Rewards-eligible, ENERGY STAR thermostats	Allows for future occupants of the home to enroll in AC Rewards. Learning thermostats cannot be modeled in software.
Peak load bonus incentive	Incentivizes builders to design homes that use less energy when systemic need for that energy is highest

Budget and Goal Considerations
The program's budgets and electric and gas energy savings goals were determined by cost estimates based on historical program expenses and forecasted participation rates.

The main budget drivers include the following:

- Administration – This category funds project planning and implementation along with program management. This includes the payment for the data aggregator serving the program.
- Advertising and Promotion – The program's direct promotion through mass market promotion, energy efficient building practice training, and sales support materials are supported with these funds.
- Participant Incentives – These funds cover builder rebates.

Involvement of Community Energy Organizations
None.

Energy Efficient Showerheads

Description
The Energy Efficient Showerheads program provides free 1.5-gallon-per-minute (GPM) high efficiency showerheads, 0.5 GPM bathroom faucet aerators, and a 1.5 GPM kitchen faucet aerator to help reduce energy costs and water use to residential customers that receive natural gas or combination service with Xcel Energy.

The program is primarily marketed to residential customers and single family homes through email and direct mail. Eligible customers are contacted and offered a free kit, valued at approximately $10-$14 depending on the specific combination of measures. The kit is shipped to customers who respond to the offer within the promotional period. Kit contents include a combination of showerheads, kitchen and bath aerators, Teflon tape, and illustrated installation instructions. Eligible customers may also purchase showerheads and aerators at a discounted rate from the Xcel Energy online store.

The Company contracts with third parties to manage all customer responses and distribute the energy efficient showerheads and aerators. The third parties are recognized distributors of energy efficiency-related products in the United States. Customer responses are tracked by the providers, given to us following the distribution, and kept in a tracking system to calculate savings.

The program's main offerings include the following:

- 1.5 GPM high efficiency showerhead;
- 1.5 GPM kitchen aerator; and
- 0.5 GPM bathroom aerator.

The main offerings are described below.

- Customers who have two bathrooms and have not yet participated in the program or participated more than six years ago are eligible to receive a kit containing:
    - Two 1.5 GPM high efficiency showerheads;
    - One 1.5 GPM kitchen aerator; and
    - Two 1.0 GPM bathroom aerators.
- Customers who have one bathroom and have not yet participated in the program or participated more than six years ago are eligible to receive a kit containing:
    - One 1.5 GPM high efficiency showerhead;
    - One 1.5 GPM kitchen aerator; and
    - One 1.0 GPM bathroom aerator.
- Customers who have not yet participated in the program or participated more than six years ago may also individually purchase some or all of the items included in the two bathroom kit from the Xcel Energy store.

Customers responding to the promotional offer must indicate if they have one or two bathrooms in their home and what fuel serves their water heater (gas, electric or unknown). Other kit combinations may be developed based on customer demand and eligibility determined by past participation.

Each new participant is allowed one kit and customers may participate in the program once every 10 years. However, previous measure life was deemed at 6 years and therefore past participants are eligible for the free measures after 6 years.

Program Changes
None.

Budget and Goal Considerations
The product budget was developed based upon the expected participation level. Using the past program performance as a guide, the cost of the measures, fulfillment, postage, and all necessary marketing efforts were included to develop the budgets.

The main budget drivers include the following:

- Administration – This covers the costs of external fulfillment, web development, rebate costs, project planning, and implementation.
- Advertising and Promotion – The program uses direct mail and email to attract customers.
- Measurement and Verification – This category provides funds to survey participating customers.

Involvement of Community Energy Organizations
None.

Home Energy Insights

Description
The Home Energy Insights program, which was formerly known as Energy Feedback, is fundamentally a behavioral conservation program. The program provides a targeted direct mailing (Report) to a designated group of residential customers, giving them specific information and recommendations on ways to reduce their energy consumption. Customers receive new information with each Report. Savings are quantified by comparing the energy consumption of the recipient group to that of a non-participating control group. The program also offers an online web portal that features even more ways for customers to learn about energy use in their homes and possibilities for energy savings, load management, and cost reductions. The web portal is available to all customers, with the only qualification being enrollment in My Account.

The program's main offerings include the following:

Personalized energy usage reports
These individualized reports are paper-mailed, emailed, or updated on the Web portal on a cadence prescribed by their tenure in the program. Reports provide:

- Customer's energy use compared to other, nearby customers who had similar usage profiles and home characteristics (occupancy, heating fuel, square footage, etc.) prior to program enrollment;
- Targeted efficiency recommendations based on home profile data available; and
- Other information such as consumption graphs or year to year bill comparisons.

Recipients are selected from among Xcel Energy Minnesota residential customers and may "opt out" of the program at any time upon request.

Through the duration of this Plan, the Company anticipates refills as-needed to ensure savings goals and to maintain participation levels.

Online Portal
This feature is available to all Minnesota residential customers. It provides the same information as energy usage reports on demand, along with more detail and other options. When visiting the web portal, customers can:

- View their neighbor comparison;
- See graphs showing energy consumption by fuel type by bill period or day;
- Earn rewards redeemable for gift cards for energy savings activities; and
- Complete a Home Energy Assessment which provides insight into how energy is used in the home as well as more accurate and actionable energy saving recommendations;
- See disaggregated energy usage by technology and end use;
    - This will be based on general information in early days. As AMI meters and data become more widespread and as customers complete Home Energy Assessments, the accuracy of this disaggregation will improve
- And receive tips and recommendations for a wide array of energy savings measures, from low- and no-cost improvements to major upgrades of building envelope and mechanical systems.

Customers are encouraged to visit My Energy through emails, targeted messaging, and social channels.

High Bill Alerts

While this service will not be available until after the launch of this Plan in 2021, the Company will develop a service to contact customers before the end of a billing cycle that are trending to have a high bill. Customers will be able to opt out of receiving High Bill Alerts.

Program Changes

The Company has chosen a new vendor for its energy usage reports and My Energy web portal presentment. This should lead to better customer engagement, experience, reduced cost, and no reduction in energy savings.

Budget and Goal Considerations

The goals were developed based on prior years' savings, attrition, and refill data. Costs are based on delivery of the reports and for hosting the portal.

The main budget driver for the program is:

- Administration – This budget provides for program management and implementation along with data management and program development.

Involvement of Community Energy Organizations

None.

Home Energy Squad®

Description
The Home Energy Squad program offers installation services to electric and gas customers who seek to improve their homes' energy efficiency and comfort as well as lower their utility bills. The program directly installs several moderate-impact, low-cost measures for combination gas and electric customers and for electric-only customers who are natural gas customers of CenterPoint Energy. In addition and where cost effective, the program installs fuel-appropriate measures in Xcel Energy electric-only and gas-only territories where the operations vendor has identified potential customers. The program seeks to assist customers' efforts to overcome barriers related to making energy improvements, including: customer confusion about product choices, varying costs, and locating qualified installers. The program charges a flat fee and allows customers to choose from a suite of energy saving measures. The program is marketed primarily within the metro area and larger out-state cities.

The program's main offerings include the following:

- Lighting measures, including:
  - LED light bulbs of various types and wattages.
- Heating and cooling measures, including:
  - Weather-stripping of two external doors;
  - Smart thermostat installation and programming;
  - Programmable thermostat installation and programming;
  - Setback of pre-existing programmable thermostats; and
  - Enrollment in the AC Rewards and Saver's Switch programs.
- Hot water measures, including:
  - Insulation blanket for water heater;
  - High efficiency showerheads and faucet aerators;
  - Temperature assessment and setback of water heater; and
  - Demand response retrofit devices for existing electric resistance water heaters (combined with high efficiency showerheads).
- Optional measures for customer purchase, including:
  - Electronics timer;
  - Premium smart thermostat installation and programming;
  - Second programmable thermostat installation; and
  - Weather-stripping of additional doors.

Program Changes
The following table summarizes program changes included in this Plan.

Change	Rationale
Enrollment in AC Rewards and Saver's Switch programs	As part of our strategy to increase participation in demand response programs, this program will be offering AC Rewards enrollment. Further details on demand response measures are provided in the technical assumptions.
Addition of demand response retrofit switches for existing electric resistance water heaters. This measure is coupled with the installation of high efficiency showerhead(s)	Enables customers with existing electric resistance water heaters to participate in a water heater demand response program for an additional incentive. This measure is combined with the installation of a high efficiency showerhead.

Budget and Goal Considerations

The program's participation and energy savings goals and budget were determined by cost estimates based on vendor proposals, potential number of participants, and historical program expenses. The main budget drivers include the following:

- Administration – This category funds program administration costs through third-party vendors, as well as third-party labor for the installation of energy efficient measures in customers' homes.
- Promotion and Advertising – This category covers print, broadcast and interactive advertising, phone and street canvassing, and event promotion. As this program progresses it requires increased costs to build awareness and to directly reach participants.

Involvement of Community Energy Organizations

Xcel Energy partners with CenterPoint Energy to serve our common customers. In addition, and where applicable, the Company and its third-party vendor engage with local community organizations and leadership to drive awareness and increase adoption of the Home Energy Squad service.

Home Lighting

Description
The Home Lighting program offers customers discounted prices on high efficiency Light Emitting Diode lamps (LEDs) at participating retailers. LEDs are an easy, low-cost way for customers to save energy and reduce their monthly electric bills. The Company is focused on increasing awareness and sales of LEDs to further drive market transformation.

The Company motivates customers to purchase LEDs by offering in-store retail discounts. The discounts are provided through collaboration with bulb manufacturers and retailers. The three entities combine resources to offer instant rebates enabling customers to purchase a variety of energy-efficient bulb models at a discounted price. The discount varies depending on the type of bulb as well as the manufacturer/retailer partner. There is no mail-in rebate form, making it easy to participate. Incentives are paid upstream and the discounts are passed on to the customer during the point-of-sale. The Company partners with retailers such as Home Depot, Walmart, Costco, Ace Hardware, and Lowes.

The objective of the Home Lighting program is to motivate customers to purchase energy-efficient lighting. The Company will focus marketing resources toward increasing awareness and sales of LEDs, in addition to helping educate customers about the product benefits, what to look for when purchasing LEDs, and the changing marketplace. The Company will use various media channels to reach customers such as: radio, TV, in-store signage, publications, bill onserts, social media, internet and sponsorship of community events. The peak sales period for energy efficient bulbs is in the fall and winter; as such, most of the promotions are scheduled during these peak buying periods.

The Company uses an RFP process each year to select participating retailers and to enable partnerships with a variety of retailers (including big box, mass merchandiser, hardware stores and discount stores) which helps to ensure optimal pricing and reduces free-ridership. The Company uses a third-party to implement the RFP and to help manage the program. The implementer is primarily responsible for tracking product sales details, including the location, types and quantities of bulbs sold each year and calculating the energy savings.

Program Changes
None.

Budget and Goal Considerations
The energy savings and budget target for the product was derived by analyzing the market potential and historical sales data, while considering new technologies, available retail channels and participating customer segments.

The main budget drivers include the following:

- Rebates – includes the discounts offered at retail stores as well as bulbs distributed at community/sporting events. We have reduced our rebates over the years as costs for LEDs have come down.
- Promotion and Advertising – includes costs for home lighting specific advertising campaign as well in store signage displays and fees for participating in community/sporting events
- Consulting – includes program administrator labor to manage the program

Involvement of Community Energy Organizations
None.

Insulation Rebate

Description
The Insulation Rebate program offers prescriptive electric and natural gas rebates to customers who upgrade insulation and air-sealing in their homes. The program captures electric and natural gas savings on existing single-family and eligible multi-unit homes that professionally install insulation and air-sealing measures. Customers must select a contractor who is registered in the Xcel Energy residential insulation rebate program. Xcel Energy electric-only customers must use electricity as their main heating source in order to qualify for the electric only portion of the rebate.

The Insulation Rebate program is marketed primarily through a mix of social media, bill onserts, the Xcel Energy website, registered trade partners and cross-marketing opportunities with other Xcel Energy programs. In addition, the program receives additional support from a channel manager to aid trade partners with program assistance.

The program's main offerings include the following prescriptive rebates:
- Attic insulation and air-sealing:
  - Must have a pre R-value of 19 or less; and
  - Must have a post R-value of 49 or greater.
- Wall insulation and air-sealing:
  - Must have empty wall cavity; and
  - Must install at least R-value of 11 or more of insulation.
- Air-tightness:
  - A reduction in CFM50 of 15% is required to qualify for the air-tightness portion of the rebate
- Smart Thermostat
  - Direct install of program approved ENERGY STAR rated thermostats at no cost if the customer also registers for the AC rewards program

Participating customers must contract for insulation services with a contractor who is registered in Xcel Energy's insulation rebate program. Requirements for becoming a registered contractor are:
- Complete an online profile at the trade partner resource center of Xcelenergy.com
- Submit a completed contractor agreement (provided by Xcel Energy)
- Have at least one technician hold at least one of the following certifications:
  - Building Performance Institute (BPI) – Residential Building Envelope Whole Home Air Leakage Control Installer (RBEWHALCI);
  - BPI – Air Leakage Control Installer (ALC); or
  - Xcel Energy approved training.

Air sealing and weather stripping must follow industry-accepted practices for mitigating air leakage. Homes can participate in the program more than once every calendar year but rebates are not issued for the same measure completed either under the Insulation Rebate program or under a different rebate program.

Program Changes
The following table summarizes changes to the program in this Plan.

Change	Rationale
Expand the list of qualification requirements for contractor participation	To expand the number of contractors who participate in the program, thus reaching more customers
Add blower door requirement to participation	Align requirements more closely with Centerpoint Energy and Minnesota Energy Resources to reduce confusion and to demonstrate air leakage reductions in homes
Combine air-sealing measure into the wall and attic measures	This will clarify our messaging that air-sealing is not a stand-alone measure that is optional. It is a requirement as part of attic and wall insulation measures.
Add program eligible thermostats	To maximize energy savings

As the table shows, the program has expanded the list of qualification requirements for contractors. The BPI – ALC certification replaces the BPI – RBEWHALCI certification; however, BPI still issues RBEWHALCI certificates to technicians who qualified under that program name. Also, we commissioned the Center for Energy and Environment to create a training course that mirrors many of the attributes of the BPI certifications and have approved that training as an alternate method for trade partners to register in the program.

Budget and Goal Considerations
The program's budgets and electric and gas energy savings goals were determined based on historical program performance and an estimate of market potential. Marketing dollars focus on cross-marketing opportunities with other Xcel Energy programs and social media, and other proven cost-effective strategies for this program.

The main budget drivers include the following:

- Administration – This category funds program planning and implementation, channel management and rebate processing.
- Advertising and Promotion – The program utilizes social media, contractor training and cross-utility marketing to promote the program, and uses direct and indirect promotions such as community outreach events in partnership with other electric and natural gas rebate programs.
- Participant Incentives – These funds cover the costs of customer rebates.
- Measurement and Verification – The program uses these funds to perform verification of submitted paperwork.
- Trade Partner Training – The program will host trainings for trade partners to become eligible to participate in the program and to educate them on current program rules.

Involvement of Community Energy Organizations
The Xcel Energy residential trade relations manager is a member of the Minnesota Building Performance Association and the MN Blue Flame Natural Gas Association to help advance and promote the program.

Refrigerator Recycling

Description
The Refrigerator Recycling program offers residential electric customers prescriptive rebates and pick-up services to dispose of their operable, inefficient refrigerator, freezer, room air conditioner, and dehumidifier units in an environmentally safe and compliant manner. The program is designed to educate customers about inefficient refrigerators and freezers, and the potential long-term cost savings and energy usage reduction from removing them.

The main offerings are described in greater detail below.

1. The program offers free pickup and recycling and a prescriptive rebate for the following:
   - Any functional refrigerator; and
   - A freezer operating as a standalone unit.

2. The program offers free pickup and recycling, in conjunction with a refrigerator or freezer, for the following:
   - Any functional residential room air conditioner; and
   - Any functional residential dehumidifier.

3. The program is limited to two refrigerators and/or freezers removed per household per year. The Company utilizes the services of a qualified third-party vendor to perform the following services:
   - Unit collection, recycling, transportation and storage;
   - Qualification of unit at the time of scheduled pick up;
   - Appliance processing and materials recycling;
   - Issuance of incentive payments;
   - Implementation of all customer service related to above activities;
   - Product tracking and reporting; and
   - Supporting Measurement and Verification requirements.

The vendor is required to comply with all local, state and federal requirements. This includes maintaining all permits and licenses required for any facilities, equipment and personnel used for this product. The vendor is bound by contract to de-manufacture and recycle all units received; none may be re-sold or placed back in service. The adherence to this process ensures that recycled units will not re-enter the market.

Xcel Energy and the third-party vendor both market the program. The target market consists of customers who are disposing of their functioning refrigerator and/or freezer. These customers generally have a single-family home with two or more individuals in the household. The marketing strategy utilizes seasonal email and social media campaigns to promote the product. Product demand often peaks in the summer months, which is associated with customer home improvement and cleaning projects. Deployment of promotional tactics coincides with these seasonal time periods, with contingency plans if goals are not made by third quarter of each year.

Program Changes
None.

Budget and Goal Considerations
The program's participation and energy savings goals and budget were determined from historical program results and costs per participant. The main budget drivers include the following:

- Administration – The program uses a third-party vendor to implement the program and perform necessary fulfilment activities.
- Participant Incentives – The program pays customer rebates with these funds.
- Labor – This budget category is used for internal marketing and rebate operations labor.
- Promotion and Advertising – This effort includes: bill onserts, direct mail, print, broadcast and online advertisements, community outreach, and social media.

Involvement of Community Energy Organizations
None.

Residential Heating and Cooling

Description
The Residential Heating and Cooling program (formerly the Residential Heating, Residential Cooling and Water Heater Rebate programs) offers prescriptive electric and gas rebates to customers who purchase a variety of new energy efficient equipment for their space heating, space cooling, and water heating needs, including: new energy efficient air conditioners, heat pumps, furnaces, boilers, electronically commutated motors, ENERGY STAR® Connected Thermostats, as well as enrollment of connected thermostats and heat pump water heaters in a variety of demand management offerings. Central air conditioners and central air source heat pumps must be installed using Quality Installation (QI) standards. QI specifications are based on the Air Conditioning Contractors of America (ACCA) Standard 5 which dictates proper sizing, airflow, duct sealing, and refrigeration charge. Incentives are provided for equipment that meets the program's efficiency standards and, where applicable, when the installation meets the QI specifications.

This program is primarily marketed to residential customers in single-family homes. The program is marketed using a variety of communication tools, including: HVAC trade partner communication, email newsletters, tradeshows, and point-of-purchase materials at retailers. The offerings in this program were previously offered and marketed through separate programs. We anticipate that this combined approach will lead to additional participation and energy savings as well as improved satisfaction for our customers and trade partners.

The program's main offerings include the following:

- Prescriptive rebates for:
  - Central air conditioners & air source heat pumps with Quality Installation;
  - Ground source heat pumps;
  - Ductless mini-split heat pumps;
  - Natural gas forced-air furnaces;
  - Natural gas water boilers;
  - Electronically commutated motors (ECM);
  - Natural gas storage tank water heaters;
  - Natural gas tankless water heaters;
  - Electric heat pump water heaters; and
  - ENERGY STAR® Connected Thermostats.

The main offerings and criteria are outlined in the following table.

Equipment	**Criteria**
Central AC Only	13 – 14.9 SEER with QI
ASHP Only	14 – 14.9 SEER with QI
Central AC & ASHP	15+ SEER/min 12.5 EER with QI
GSHP	14.1 EER Closed Loop
Ductless Mini-Split Heat Pump	15.0+ SEER, 9+ HSPF
Gas Furnace, Existing Home	95% AFUE
Gas Furnace, Existing Home	96% AFUE
Gas Furnace, Existing Home	97% AFUE

Gas Furnace, New Home	95% AFUE
Gas Furnace, New Home	96% AFUE
Gas Furnace, New Home	97% AFUE
Gas Hot Water Boiler	85% AFUE
Gas Hot Water Boiler	90% AFUE
Gas Hot Water Boiler	95% AFUE
ECM – Retrofit on Existing Furnace	N/A
Gas storage water heater	.64 UEF, Medium Draw
Gas storage water heater	.68 UEF, High Draw
Gas tankless water heater	.87 UEF, Medium or High Draw
Electric heat pump water heater	ENERGY STAR®
Electric heat pump water heater (grid-enabled)	ENERGY STAR®, grid enabled
Connected Thermostat	ENERGY STAR®

To be eligible for the AC and ASHP program incentives, customers must use a participating contractor for the installation. Participating installation companies have at least one installer who has taken and passed an online QI assessment. Xcel Energy also accepts, but does not require, North American Technician's Excellence (NATE) certification to become a participating contractor. A list of participating contractors is available to customers from Xcel Energy. All other incentives in the program are available for customers using any contractor. Consistent with past practice, the Company will continue to honor rebate levels offered in the previous plan for equipment which is purchased and installed in 2020 and is submitted in 2021 by the deadline stated on the rebate application.

Additionally, as part of the Company's strategy to increase participation in demand response programs, this program will be offering AC Rewards. To be eligible for the ENERGY STAR® Connected Thermostat rebate, the thermostat model must be eligible to participate in the Company's AC Rewards program. Further details on demand response measures are provided in the technical assumptions.

The Company continues to investigate ways to provide a more comprehensive experience for our residential customers to simplify the process for installing capital intensive energy efficient equipment. This may include an end-to-end solution where the customer chooses from any or all of the following as applicable: advice and analysis of the available equipment options, financing, assistance with choosing qualified contractors, and enrollment in Demand Management, green programs and/or warranty services.

Program Changes
The following table summarizes changes to the program in this Plan.

Change	Rationale
Combination of existing measures from three programs (Residential Cooling, Residential Heating, and Water Heater Rebate)	Streamlines the process and improves customer and contractor experience, leading to increased participation and savings.
Change lifetime for AC/ASHP to 18 years	Supported by new research.
Increase rebates for heat pumps	Intended to increase participation in this efficient and cost-effective technology.
Add gas savings for Central AC/ASHP quality installation measure	Capture gas savings for duct sealing component of the Central AC/ASHP quality installation when a customer with gas and electric service with a gas furnace installs a new air conditioner
New measure for mini-split heat pumps for customers with electric resistance heating	New offering for customers with electric resistance heating. Mini-split heat pumps will have higher savings for these customers due to the electric resistance heat baseline, and a higher rebate amount will be offered.
Elimination of rebates for ECMs on new furnaces	ECMs are now the baseline for new furnaces
Add heating savings for heat pumps	Currently, we are only claiming cooling savings for various heat pump measures. The calculations have been updated to include heating savings.
Increase efficiency for lowest tier of boilers from 84% to 85% AFUE	The Department of Energy baseline for boilers has increased to 84% AFUE.
Addition of ENERGY STAR® Connected Thermostats	Smart thermostats are being added as part of the new, comprehensive program offering.
Addition of heat pump water heaters over 55 gallons	Heat pump water heaters over 55 gallons are a popular option for customers and yield substantial savings over electric resistance water heaters.

Budget and Goal Considerations and Participation Development
The budget for the Residential Heating and Cooling program was developed based on historical costs per participant for the Residential Cooling, Residential Heating, Water Heating, and Thermostat Optimization programs and was estimated according to expected participation. Taking into consideration the economic state of the market, the program goals reflect steady participation and a decrease in the promotional budget to provide a cost-effective program for our stakeholders.

The main budget drivers include the following:

- Administration – This category funds administration labor, materials, postage and rebate processing labor and measure and verification.
- Promotion – The program utilizes low cost promotions including bill onserts, email marketing, direct mail marketing, social media, blogs, and Trade Partner outreach.
- Participant Incentives – These funds customer rebates for qualifying products.

Involvement of Community Energy Organizations
None.

School Education Kits

Description
The School Education Kits program offers a multi-component kit that combines classroom activities and in-home projects to fifth or sixth grade students and their parents to teach them about energy and water conservation. The program targets schools within our Minnesota service territory that receive both electric and natural gas service and to those teachers and students who enroll in the program through the third-party implementers.

The program's main offering is the Take Action Kit containing the following:

- Natural Resources Fact Chart;
- Digital water/air thermometer;
- FilterTone alarm;
- Energy efficiency showerhead (1.5 GPM);
- Kitchen aerator (1.5 GPM);
- Bathroom aerator (1.0 GPM);
- Teflon tape;
- Two 9-Watt LED light bulb;
- Two 11-Watt LED light;
- Flow rate test bag;
- LED night light;
- Parent comment card; and
- Think, Talk, Take Action! Wristband.

This prescriptive program provides direct impact savings, helps to build awareness of energy conservation at a young age, and provides energy and water savings to customers of various income levels. Traditional marketing tactics are not needed since schools are selected to ensure maximum outreach. Once schools are selected and enrolled, a third-party implementer recruits and trains the teachers, provides all materials, distributes the kits, and continues ongoing support if the teachers have questions while implementing the program. Classroom support is available via fax, phone, email, and by a toll-free 800 number.

Teachers can enroll through a variety of channels. If teacher response is insufficient, the third-party provider implements contingencies for additional outreach. Upon enrollment, teachers dictate to the third-party when in the school year they would like to use the program materials and provide accurate enrollment numbers. The third-party staff remains in contact with teachers throughout the school year to assist teachers as needed, as well as to ensure return of the surveys that provide Measurement and Verification results. It can take up to three months to receive the results from each elementary school depending on when the teachers begin the activity.

Program Changes
The following table summarizes program changes made in this Plan.

Change	Rationale
Joint school kits with CenterPoint Energy	Allows the program to reach more customers and deliver cost-beneficial electric and gas savings.

Budget and Goal Considerations
The program's participation, electric and natural gas energy savings goals, and budgets were estimated using historical program results and proposed third-party costs. The main budget drivers include the following:

- Administration – This funds the program's internal labor and external fulfillment by our third-party implementer, which includes: project planning, turn-key coordination, implementation, marketing, tracking of installations/surveys, call center and online help centers, measurement and verification of the program, and enrollment/reporting.
- Participant Incentives – This category covers the costs of the kit contents.

Involvement of Community Energy Organizations
We work with our Community Affairs department, Account Management group, and local community non-profits to identify schools to participate in the program. We also look for additional opportunities when available for cross promotion, outreach, or cost sharing.

Whole Home Efficiency

Description
The Whole Home Efficiency program offers prescriptive electric and gas rebates to residential customers who take a whole-house approach to improving the energy efficiency of their existing, single-family homes. The program offers customers personal assistance from beginning to end of their projects, direct contractor resources, rebates to reduce the project cost, direct install options, and independent verification of the improvements after completion.

Customers must be both electric and natural gas customers of Xcel Energy to participate. An energy audit through Xcel Energy or by a company-approved contractor must precede the project and must include a blower door test. The program is marketed primarily through Xcel Energy's enhanced Home Energy Squad program and secondarily through the trades, with the objective of helping customers find and prioritize energy efficiency improvements in their homes.

The program's main offerings include prescriptive rebates for:
- Air leakage reduction;
- Attic and wall insulation;
- Heating and cooling systems;
- Water heaters;
- Clothes washers, and
- Refrigerators.

The program also offers direct install for:
- ENERGY STAR® Connected Thermostats enrolled in AC Rewards; and
- ENERGY STAR® dehumidifiers

Any customer with electricity and natural gas provided by Xcel Energy may participate in Whole Home Efficiency. Incentives for building envelope (air sealing and insulation) measures will be uncapped and based on the deemed energy savings comparing ex-ante and ex-post building envelope conditions. Customers then can choose other improvements like water heaters, heating systems, or cooling systems to continue to optimize their home. The customer can receive rebates for a whole-house project within one year of enrolling in the program. All improvements are verified by the auditor doing the final inspection. Customers must use company-approved contractors, and those contractors receive training about the program and its required processes.

Customers may also receive additional incentive payments (bonuses) for installing multiple measures in their home. Xcel Energy hopes this will offset the reduced underlying rebate amounts outlined below.

Program Changes
The following table summarizes proposed program changes made in this Plan.

Change	Rationale
Change incentive structure for building envelope rebates	Improve cost effectiveness of program.
Change rebate amounts for individual measures	Align with prescriptive rebate amounts to mitigate customer confusion.
Modify list of qualifying equipment	Align with prescriptive rebate measure mix to mitigate customer confusion.
Require submission of ACCA Manual J for heating and cooling system rebates	Ensure optimal equipment installation and efficiency for participating customers.
Add bonus structure for prescriptive rebate measures	Encourage multiple measures to optimize the improved home's performance.
Add ENERGY STAR® connected thermostat enrolled in AC Rewards (direct install)	Improve the savings of the thermostat measure and offer an opportunity for Whole Home Efficiency customers to participate in demand management opportunities.
Remove LED bulbs (direct install)	Minimal customer participation.
Remove Showerhead and faucet aerator (direct install)	Minimal customer participation.
Remove Programmable Thermostat	Minimal customer participation.

Budget and Goal Considerations
The program's budgets and electric and gas energy savings goals were determined using cost and savings estimates based on discussions with vendor and by historical program performance.

The main budget drivers include the following:

- Administration – This category covers program planning and implementation as well as program management.
- Advertising and Promotion – The program is marketed through advertising and support materials, including brochures and welcome kits.
- Participant Incentives – This category covers rebates and costs for direct install measures.
- Measurement and Verification – The program funds a third-party to inspect 100% of projects completion and to do the exit blower door test.

Involvement of Community Energy Organizations
None.

Residential Demand Response

Description
The Company offers three products as part of the Residential Demand Response program: Saver's Switch®, AC Rewards and Smart Water Heaters (water heater demand management). The products seek to reduce system load by curtailing central air conditioners and eligible electric water heaters and are generally utilized on hot summer days when electric load is expected to reach near-peak capacity. As part of our strategy to increase participation in demand response programs, this program will be offered in direct partnership with several energy efficiency programs. Further details on each product are provided below and in the technical assumptions.

Saver's Switch
Saver's Switch is Xcel Energy's largest residential load management offering. The product gives participating customers bill discounts in exchange for allowing the Company to reduce their air conditioning and, if applicable, water heater usage on days of peak demand. During a control event (typically a hot, humid day or evening), air conditioners are cycled on and off in a manner designed to reduce the load by 50 percent.

Enrolled electric water heater load is shed entirely for the duration of the control event, which can occur at any time of year. Previously heated water would be available for customer use, but water heaters would not heat new water until the end of the event. Unlike the AC program, water heaters can be turned off at any time of system need, not just during the traditional summer afternoon peaks.

Air conditioners and water heaters are controlled via a radio operated switch installed by a licensed electrician on or near the customer's central air conditioning unit. Participants in the air conditioning program have the option of enrolling a qualifying electric water heater; however, customers cannot enroll a water heater on its own. The program's main offerings include the following:

- Participating air conditioning customers receive a 15 percent discount off the electric energy charges on their bills between June and September.
- Water heater participants receive 2 percent off the same charges year-round.

The Saver's Switch program has operated in Minnesota since 1990. Many of the switches installed early in the program are now beyond their estimated 15-year useful life. In this Plan, we intend to continue to use the Virtual Visit tool when applicable to identify switches that should be replaced. We also plan to proactively replace switches more than 15 years old.

AC Rewards
AC Rewards, which launched in 2017, also seeks to reduce AC load during demand peaks. Participants can receive up-front rebates for enrolling a qualifying thermostat, and receive annual bill credits, in exchange for allowing the Company to temporarily adjust the set point on the thermostat during control events. The Company will add measures for attached homes such as duplexes and townhomes as well as multifamily facilities in the Residential Demand Response product under the AC Rewards offering. The Company wants to expand customer segments that are eligible to participate in the Residential Demand Response product. Currently, certain thermostats from Honeywell, ecobee, and Emerson are eligible for enrollment.

- Customers joining AC Rewards receive $75 bill credit
- Customers purchasing an AC Rewards eligible device receive $50 Energy Efficiency rebate
- The annual participation incentive is $25, paid out in October via a bill credit

AC Reward participants retain the ability to override individual control events, except in the case of a systems emergency. The Company reserves the right to remove from the product participants that are deemed to be overriding too many events.

Smart Water Heaters

Smart water heaters are new product to Residential Demand Response. Customers owning qualifying electric heat pump water heaters capable of receiving control signals from the utility are eligible for enrollment. Qualifying enrolled water heaters will be controlled in two ways:

- Morning peak demand load reduction – The temperature setpoint of enrolled water heaters would be increased slowly in the early morning hours with the heat pump mechanism. At the onset of the morning peak period, the water heater would be filled with hotter-than-normal water. Hot water from the water heater would be diluted with a mixing valve to deliver water at standard distribution temperatures. The water heater would rely less, if at all, on electric resistance operation in order to meet peak morning demand, conserving energy.
- Afternoon peak demand load reduction – In a peak load event, normally on hot summer afternoons, the enrolled water heaters would be turned off for the duration of the control event. Previously heated water would be available for customer use. However, water heaters would not heat new water until the end of the event. This part of the Smart Water Heaters product operates the same way as an electric water heater enrolled in Saver's Switch.

In order to participate, customers need to have a water heater equipped with a receiver for over the air operating instructions and a mixing valve as a safety measure for when water in the tank is heated beyond the original set point. Participants in the program will receive an annual $25 bill credit for their participation.

Program Changes

The following table summarizes changes to the program in this Plan to the AC Rewards product.

Change	**Rationale**
Added $50 Energy Efficiency Rebate to BYOT channel	Added the measure to the AC Rewards product, for a more holistic product offering.
Added additional residential structures	Program expanding program offering form detached homes to attached homes. Example townhomes and multifamily facilities. To expand customer options and add new demand management resource building options.
Added Emerson Sensi and Sensi Touch models as AC Rewards qualifying thermostats	Increase customer options, and Demand Management resource tools.

Budget and Goal Considerations
The program budget and savings were developed based on equipment and installation costs for the number of switches to be installed and replaced.

The main budget drivers include the following:

- Administration – This budget category will cover the costs of internal labor for program planning and implementation, as well as the costs of external contract labor and software maintenance.
- Customer Services – The program uses a third-party to install the switches.
- Enrollment incentives for customers bringing smart thermostats into AC Rewards.
- Advertising and Promotion to generate awareness of Saver's Switch and AC Rewards.
- Measurement and Verification – The program hires a third-party consultant to conduct measurement and verification to determine the savings per switch achieved each year.

Involvement of Community Energy Organizations
None.

Consumer Education

Description
The Consumer Education program is an indirect-impact program that provides residential customers with the information and resources to reduce their energy usage. Because the residential segment is demographically varied, Xcel Energy employs a variety of resources to communicate the conservation message.

The program's communication strategies include the following:

- Annual community and conservation events and local community event outreach with energy efficiency messages;
- Digital media;
- Direct mail marketing to communicate energy conservation messages;
- Sponsorship of local events that support the mission of protecting our environment, such as Earth Day events;
- Sponsorship of local conservation publications;
- Publication of reference materials; and
- Sponsorship of seminars and conferences supporting residential conservation and energy efficiency.

The program focuses on renewing existing partnerships and building new relationships. In addition, the program employs digital media strategies to drive active engagement in energy efficiency. By continuing to diversify the communication channels, the program increases residential customer knowledge base and provides a greater variety of resource options and services.

The program uses engaging event activations to provide information and resources that help residential customers reduce their energy usage at home. The common theme, in messaging, will convey the importance of everyone's role in becoming more energy efficient. The program will target a variety of high traffic events throughout the year to reach a wide-ranging demographic of Xcel Energy customers. Events include professional and regional sports games, county fairs, arts and cultural festivals and a variety of other community events.

Program Changes
None.

Budget and Goal Considerations and Participation Development
The program budgets were developed through identification of customer segments, costs to produce materials, and event and sponsorship costs. The participation goals were established through targeted outreach to customer segments and use of multiple channels for delivery of energy efficiency messaging.

The main budget drivers include the following:

- Administration – This category represents the labor needed for program planning and implementation.
- Advertising and Promotion – This budget includes funds for printed materials, community outreach events, sponsorships, and digital advertising.

Involvement of Community Energy Organizations
None.

Home Energy Audit

Description
The Home Energy Audit program offers substantially discounted energy auditing services to residential customers. The purpose of this program is to improve energy savings by influencing homeowners' and renters' behaviors through conservation education. This program is marketed through seasonal advertising and bill inserts as increases in monthly energy bills tend to drive program activity. We take advantage of local "green event" opportunities and direct mail campaigns as needed.

The program's main offerings include the following two tiers of audits:

- Home Walkthrough ($30); and
- Standard Audit with Infrared ($60).

The main offerings are described in greater detail below.

Home Walkthrough Audits
The Home Walkthrough begins with the auditor's review and analysis of the customer's billing history and a discussion surrounding any concerns or questions that the customer may have regarding home energy usage and related comfort. The auditor performs an assessment of the interior and exterior of the home and provides a review of the top recommendations to the homeowner. This option is free to income-qualifying customers. An electronic personalized audit report is emailed to the customer highlighting the top recommendations and providing rebate program information.

Standard Audit with Infrared
The Standard Audit with infrared includes all Home Walkthrough audit components, as well as a blower door test and a combustion appliance zone (CAZ) test. The blower door test is conducted in every home and the CAZ test is performed only if atmospherically vented appliances are present. Also included is an infrared scan to evaluate internal structures such as drywall and insulation and to determine temperature differences where insulation is present, missing, or not working effectively. In order for the infrared scan to be effective there needs to be a certain differential between the indoor and outdoor air temperatures. The infrared scan is offered when applicable.

Customers may get a Home Walkthrough audit every three years, or upgrade to a more extensive audit more frequently. The charges to the customer are assessed on bills after the audit is completed.

Program Changes
None.

Budget and Goal Considerations
The program's participation and budgets were determined by historical program participation targets and expenses.

The main budget drivers include the following:

- Administration – The budget includes the costs of internal labor and external contract labor to support the program.

- Customer Services – This category represents the costs of the third-party auditors, as well as the payments made by customers for their audits.
- Advertising and Promotion – The program includes a modest promotional budget to steer customers to the audits.

Involvement of Community Energy Organizations
None.

Residential Lamp Recycling

Description
The Residential Lamp Recycling program encourages electric customers in Minnesota to recycle their spent fluorescent bulbs instead of discarding them to ensure that mercury does not get into the environment.

The program's main offerings include the following:

- Free compact fluorescent light bulb recycling at participating local hardware stores and partnering county hazardous waste facilities; and
- Coupons for 50¢ off the recycling fee for each fluorescent tube and HID bulb. The coupons are available at participating hardware stores and on the Company's website.

The Residential Lamp Recycling Program is marketed primarily through Xcel Energy's Home Lighting program promotions, participating hardware stores, and on the Xcel Energy website. A search feature allows customers to search by zip code to find the nearest recycling locations.

The Company follows the requirements of Minn. Stat. 216B.241, subd 5, which necessitates public utilities to notify customers that fluorescent recycling is the law in Minnesota. Every Residential Lamp Recycling and Home Lighting promotional piece includes a disclaimer regarding the statute, such as, "Fluorescent lamps contain small amounts of mercury that are harmful to the environment. In Minnesota, it is illegal to dispose of spent mercury bulbs in household trash receptacles."

Program Changes
None.

Budget and Goal Considerations
The budget was developed based on historical spending and the expected number of bulbs to be recycled in the coming years. The budget is set to decrease annually due to an anticipated decline of bulbs recycled each year. The promotional budget will remain consistent throughout the Triennial Plan.

The main budget drivers include the following:

- Administration – This provides funds for internal labor and program implementation.
- Promotion and Advertising– We market this program with the Home Lighting promotions.

Involvement of Community Energy Organizations
None.

Low-Income Segment

Description
The goal of the Low-Income Segment is to educate income-eligible customers about their energy usage and how to reduce their monthly utility bills. To address this customer group, which primarily resides in single- and multi-family rental homes, the Company provides materials and assistance to help ease the energy-cost burden, making permanent changes in income-qualified residences that help improve comfort and lower costs.

Programs
The Low-Income Segment will continue to offer three programs in 2020: Home Energy Savings (HESP), Low-Income Home Energy Squad, and Multi-Family Energy Savings (MESP). The programs offer analyses of both gas and electric consumption to income-qualified customers and provide them with products and services that assist in lowering their monthly energy bills. Through HESP, customers may also be eligible for replacement of appliances and HVAC measures based on the condition of the existing units identified during the analysis phase. MESP offers electric home energy efficiency measures and educational information to apartment dwellers. Third-party program implementers will deliver all three programs' operations.

Overall Goals
Most of the energy savings within the Segment will come from energy efficient lighting, insulation, HVAC measures and appliances. The table below provides a breakdown of the Segment participation, budget and savings goals in relation to our total CIP portfolio.

	Electric				Gas		
Plan Year	**Participation**	**Budget**	**Gen kW**	**Gen kWh**	**Participation**	**Budget**	**Dth**
2021	5,410	$2,847,592	708	1,735,820	1,012	$1,794,107	11,753
2022	5,229	$2,948,593	850	1,863,863	1,131	$1,865,253	12,933
2023	5,789	$3,084,572	1,021	2,009,241	1,103	$1,922,225	13,686

Market Analysis
The interest in and need for these energy efficiency services continues, and we anticipate customers struggling to pay their monthly bills. This segment plays a vital role by providing programs and services to help lower energy bills and improve the comfort of Low-Income Segment participant homes.

Marketing/Advertising/Promotion
We strive to build awareness of our income-qualified program offerings with participating community agencies who have direct access to these customers and manage enrollment. In this Plan, the income-qualified programs will also be marketed through a variety of activities including neighborhood community events, workshops, and partnerships with local non-profits.

Overall Policies
To participate in the Low-Income Segment programs, customers must have incomes that align with State Median Income and/or Federal Poverty level eligibility guidelines. The Segment does not have additional unique policies. Each program will enforce its participation and equipment eligibility rules

and requirements; however, they may be modified when warranted and within guidance from the Minnesota Department of Commerce.

Involvement with Interested Individuals and Entities

The Low-Income Segment programs will continue to be delivered through third-party vendors. We also work with a variety of energy industry, communities, community outreach groups and other organizations providing services to income-qualified residents. The Company works with several local organizations to refine our existing programs, shape new programs, and discuss partnership opportunities. These local organizations include, but are not limited to:

- Energy CENTS Coalition (ECC);
- Fresh Energy;
- Minnesota Multifamily Affordable Housing Energy Network (MMAHEN);and
- Sustainable Resources Center, Inc. (SRC).

Home Energy Savings

Description
The Home Energy Savings program (HESP) offers free home energy education and improvement services to income-qualifying customers. Participating customers receive a home visit and energy bill analysis to learn about energy conservation. Based on the findings in the home visit, we determine the customer's eligibility for other offerings in the program, including home weatherization and appliance replacements.

To qualify for participation in HESP, Xcel Energy customers must:

- Have a household income that is at 50 percent of the State Median Income guidelines or at 200 percent of the federal poverty level, whichever is greater;
- Properties with two to four housing units, at least 50 percent of the households must have incomes below 50 percent of the State Median Income guidelines or 200 percent of the federal poverty level, whichever is greater; and
- Rental properties must agree to maintain affordable rent in order to receive benefits from this program.

For rental properties, HESP will use the WAP policy as the guidelines for 1-4 unit rental properties except in cases where the property owner also qualifies for HESP services. For rental properties where the owner is income-qualified, HESP services are provided at no cost. All other rental properties the property owner contributions will be handled as follows:

- Service Providers may choose to require property owner contributions when providing HESP services in rental properties containing 2-4 units; the amount of financial contribution is determined by the Service Provider and must be documented. Property owner contribution for rental properties containing 2 or more units may be used to pay for the entire cost of an individual measure/s or to complete work beyond the scope of HESP, as determined by the Service Provider.
- Service Providers may not require property owner contributions for one (1) unit rental properties. However, contributions for one-unit dwellings are optional and may be accepted.
- Property owners must complete work to come into compliance with MN Statute 504B.161 or other local rental codes, if identified through the audit. This work mustbe completed prior to or in conjunction with weatherization projects. This is not counted towards property owner contribution requirements.

The program is implemented through third-party providers who are responsible for customer recruitment, enrollment, income eligibility confirmation, subcontractor management, program forecasting, tracking, and reporting. The program is promoted by Xcel Energy through various advertising and promotion efforts which could include community engagement, direct mail, email, bill onsert and online. It is also supported with efforts by our Customer Care and Low-Income Assistance departments.

The program's main offerings include the following:

- Free electric home services including:
    - Home energy educational visits;

- Screw-in LED bulbs;
- Smart power strip;
- Energy-efficient aerators and showerheads in homes with electric water heaters;
- Refrigerator replacements and recycling;
- Freezer replacements and recycling;
- Window and wall AC replacements and recycling;
- Air Source Heat Pump in electrically heated homes with Central AC;
- Air Source Heat Pump water heaters for homes with electric water heaters;
- Electronically commutated motors retrofit in existing furnaces; and
- Attic insulation for electrically heated homes.

- Free natural gas home services including:
  - Energy-efficient aerators and showerheads in homes with natural gas water heaters;
  - Attic insulation and air-sealing;
  - Wall insulation;
  - Furnace or boiler tune-up;
  - Furnace or boiler replacement; and
  - Water heater replacement.

The main offerings are described below.

Electric Home Services

The home energy educational visits are available to all income-qualified customers in Xcel Energy's electric service territory and are provided during a Low-Income Home Energy Squad visit. These visits include:

- Analysis of the electric bill;
- Home energy assessment and education;
- Inspection and evaluation of major appliances;
- Energy savings recommendations; and
- Distribution of energy conservation educational materials.

Appliance replacements are available to those customers whose appliances meet the following criteria:

- Customer must own the appliance or provide a signed waver to allow replacement and recycling of the old inefficient appliance;
- Appliance must be used on a regular basis;
- Appliance must be in working condition;
- Refrigerators must be the primary unit in the home unless the customer agrees to recycle a second working appliance as well; and
- Window or wall AC units with an EER rating less than 10.8.

For homes where electricity provides the primary heating source, the following upgrades are available:

- Attic and wall insulation;
- Air Source Heat Pumps with a minimum of 16 SEER to replace existing inefficient central AC unit; and

- Air Source Heat Pump Water Heaters to replace existing inefficient electric tank water heater.

Natural Gas Home Services

These services are available to all income-qualified customers in Xcel Energy's natural gas service territory:

- DOE standard energy audit including blower door testing;
- Detailed specifications for all weatherization measures;
- Insulation of attic and bypass sealing to an R-value of 48 or greater;
- Insulation of walls to an R-value of 11 or greater;
- Carbon monoxide detector installed with any weatherization job; and
- Furnace or boiler tune-up.

We provide funding for the replacement of old inefficient furnaces, boilers and water heaters with the following:

- Furnaces with an AFUE less than 95 percent;
- Boilers with an AFUE less than 85 percent; and
- Natural gas water heaters with an EF less than 0.67.

As part of our strategy to increase participation in demand response programs, this program will also be offering Saver's Switch®. Further details on demand response measures are provided in the technical assumptions.

Program Changes

The following table summarizes changes to the Home Energy Savings program included in this Plan.

Change	**Rationale**
Add the following natural gas energy saving measures: Energy-efficient aerators and showerheads, furnace and boiler tune-up.	To expand the natural gas energy saving services provided.
Add the following electric energy saving measures: ECM retrofit installation in existing furnace, Air source heat pump, and Air source heat pump water heater.	To expand the electric energy saving services provided.
Remove ECM.	This measure is considered baseline in new furnace installations.
Offer Residential Saver's Switch as an option for participants who have central AC.	To increase low-income customer participation in demand response programs.

Budget and Goal Considerations

The program's participation and energy savings goals and budgets were based on historical program data.

The main budget drivers include the following:

- Administration – Covers internal labor and expenses for program planning, implementation and vendor administration, and the services provided by Third-party program implementers.
- Rebates - Covers the cost of the equipment/measures installed.
- Promotion and Advertising - The program's direct advertising, bill onserts, communications outreach events and more are supported with these funds.

Involvement of Community Energy Organizations

The Company continuously works to build relationships with existing agencies, non-profit organizations, and communities throughout the state. These partnerships allow us to improve program awareness and increase program participation. We are also members of a national ACEEE working group focused on energy efficiency for low-income customers.

Low-Income Home Energy Squad®

Description
The Low-Income Home Energy Squad program offers installation services to electric and natural gas customers who seek to improve their homes' comfort and lower their utility bills. The program is marketed to income-qualifying customers and directly installs several moderate-impact, low-cost measures for the Company's combination gas and electric customers as well as for electric-only customers who are natural gas customers of CenterPoint Energy. The program pays for the equipment and labor costs to install several appropriate, moderate-impact measures. The program helps to remove barriers for customers to make energy improvements.

The program's main offerings include the following:

- LED light bulbs of various types and wattages.
- Heating and cooling measures, including:
  - Weather-stripping of two external doors;
  - Smart thermostat installation and programming;
  - Programmable thermostat installation and programming;
  - Setback of pre-existing programmable thermostats; and
  - Enrollment in the AC Rewards and Saver's Switch programs.
- Hot water measures, including:
  - Insulation blanket for water heater;
  - High efficiency showerheads and faucet aerators;
  - Temperature assessment and setback of water heater; and
  - Demand response retrofit devices for existing electric resistance water heaters (combined with high efficiency showerheads).

Program Changes
The following table summarizes changes made to the Low-Income Home Energy Squad program in this Plan.

Change	Rationale
Enrollment in AC Rewards program	As part of our strategy to increase customer participation in demand response programs, this program will be offering AC Rewards enrollment. Further details on Demand Response measures are provided in the technical assumptions.
Enrollment in Saver's Switch program	As part of our strategy to increase participation in demand response programs, this program will be promoting Saver's Switch enrollment.
Addition of demand response retrofit switches for existing electric resistance water heaters coupled with the installation of high efficiency showerhead(s).	Enables customers with existing electric resistance water heaters to participate in a water heater demand response program for an additional incentive. This measure is combined with the installation of a high efficiency showerhead.

Budget and Goal Considerations
The program's participation and energy savings goals and budget were determined by cost estimates based on vendor proposals, potential number of participants, and historical program expenses. The main budget drivers include the following:

- Administration – This budget funds program administration costs through third-party vendors, as well as third-party labor for the installation of energy efficient measures in customers' homes.
- Promotion and Advertising – This category covers print, broadcast and interactive advertising, phone and street canvassing, and event promotion. As this program progresses, it requires increased costs to build awareness and directly reach participants.

Involvement of Community Energy Organizations
Xcel Energy contracts with local third-party implementers to provide this service. In addition, and where applicable, the Company and its third-party vendors engage local community organizations and leadership to increase awareness and drive adoption of the Low-Income Home Energy Squad service.

Multi-Family Energy Savings

Description
The Multi-Family Energy Savings program offers free education and services to qualifying multi-family buildings. The program provides electric services to income-qualifying renters and is designed to reach these renters and support qualified affordable housing through building-wide projects. The program offers information on additional energy saving actions the building residents can take beyond the program as well as free in-unit energy upgrades, including LEDs and electric appliance replacements.

To qualify, multi-family buildings with five or more units in our electric territory must meet the following criteria:

- For properties with five or more units, 66 percent of the households must have incomes below 50 percent of the State Median Income guidelines; and
- Properties with five or more units must follow the Low-Income Verification guidelines posted on the Minnesota Department of Commerce's Division of Energy Resources website.

The program is administered by a third-party implementer that can provide services throughout Xcel Energy's Minnesota electric service territory. The program implementer is responsible for customer recruitment, enrollment, income eligibility confirmation, equipment procurement and installation, subcontractor management, program forecasting, tracking, and reporting. The program is promoted through outreach with multifamily stakeholders and associations, past participants and referrals through other CIP programs. Minimal promotional activities have been necessary to date, but tactics that would be deployed if needed are direct mail campaigns and sales calls to qualifying buildings, which are identified through local resources such as HUD and LIHEAP.

The program's main offering is free electric equipment and installations, including:

- LEDs;
- Refrigerator replacements and recycling;
- Freezer replacements and recycling;
- Window air conditioner (AC) replacements and recycling;
- Wall/sleeve AC replacements and recycling; and
- Mini-split air source heat pump replacements and recycling.

This program also provides renter educational materials, in-unit electric energy assessments, and in-unit LED installation to qualified buildings. In addition, appliance replacement and recycling is provided to those buildings/units where the appliances meet the following criteria:

- Appliance must be used on a regular basis;
- Appliance must be in working condition;
- Refrigerator must be the primary one used in the unit, unless customer agrees to recycle a second working appliance as well;
- Window/wall AC units must have an EER rating of 10.8 or less to be replaced; and
- Air source heat pump replacements are for units that are electrically heated.

Appliances that are replaced through this program continue to be the property of the original owner. For example, refrigerators owned by the building owner continue to be property of the building owner and AC units owned by the tenant continue to be property of the tenant.

Program Changes
In this Plan, we will add mini-split air source heat pump replacements and recycling to drive more electric energy savings.

Budget and Goal Considerations
The program's participation and energy savings goals and budget were based on historical program data.

The main budget drivers include the following:

- Administration – Covers internal labor and expenses for program planning, implementation and vendor administration, and services provided by third-party program implementers.
- Rebates – Covers the cost of the equipment/measures installed.
- Promotion and Advertising – The program's marketing materials, direct advertising, communications outreach events and more are supported with these funds.

Involvement of Community Energy Organizations
This program is administered by a third-party implementer.

Planning Segment

Description
The Planning Segment includes indirect-impact efforts that are not directly affiliated with a specific program. The overall purpose of the Planning Segment is to:

- Increase awareness and participation in our programs through CIP-specific advertising and promotional messages;
- Provide software and hardware tools and processes to make it easier for internal staff and customers to manage and participate in our programs;
- Provide strategic direction for Xcel Energy's CIP portfolio;
- Ensure CIP-related regulatory compliance;
- Guide the Company's internal policy issues related to CIP; and,
- Train the Company's Marketing & Sales staff for effective performance.

Programs
The Planning Segment includes Advertising & Promotion, Application Development and Maintenance, CIP Training and Regulatory Affairs.

Overall Goals
The budgets for this Segment were developed based on historical costs and anticipated market increases for future costs. As an indirect-impact Segment, there are no savings goals associated with these efforts. A budget breakdown is provided in the following table:

	Electric				Gas		
Plan Year	**Participation**	**Budget**	**Gen kW**	**Gen kWh**	**Participation**	**Budget**	**Dth**
2021	N/A	$11,425,187	N/A	N/A	N/A	$2,582,474	N/A
2022	N/A	$11,912,594	N/A	N/A	N/A	$2,675,452	N/A
2023	N/A	$12,568,132	N/A	N/A	N/A	$2,893,701	N/A

Market Analysis
Not applicable.

Marketing/Advertising/Promotion
Please see the description for the Advertising and Promotion budget for additional details.

Overall Policies
As the Planning Segment is an indirect-impact segment, the programs and budgets within this segment are focused on providing support to our programs and do not have specific policies related to customer participation.

Involvement with Interested Individuals and Entities
Most community engagement and involvement is conducted through our direct impact programs. The Regulatory Affairs team regularly engages with various interested individuals and entities and often through processes managed by the Minnesota Department of Commerce.

Advertising & Promotion

Description
The Advertising & Promotion budget drives awareness of electric and gas energy solutions options with broad appeal among all types of customers. The budget is allocated internally between residential and business segments to support their respective program objectives. The advertising and promotion strategy objectives are to ensure that the Company's energy solutions are top-of-mind during customer energy-related purchasing decisions, and to encourage energy saving action for their homes and businesses. The budget's main offerings are described below:

Various media types help us reach customers at different stages of the efficiency decision-making process. Through these various media channels, the Company strives to:

- Build awareness via broadcast media;
- Capture attention through print and digital media, sponsorship, and events; and
- Create engagement via interactive media and direct marketing.

Through our advertising and promotion efforts, we support our portfolio by:

- Driving web visits for program information and educational content;
- Encouraging engagement with our digital media and direct-marketing efforts;
- Maintaining awareness, likeability and favorable opinion of our offerings;
- Creating an emotional connection by appealing to individual needs and barriers;
- Sponsoring cost-effective events and outreach; and
- Maintaining traditional outreach via marketing tactics that deliver the most cost-effective impact.

Program Changes
None.

Budget and Goal Considerations
The budget was determined by using cost estimates from past projects, vendor proposals, current customer counts, current conservation advertising budgets, known costs for creating new campaigns, and other general industry pricing knowledge. As the Company continues to optimize the marketing mix, the budget gives us the flexibility to choose the tactics and tools necessary to effectively promote customer solutions in balance with increasing costs.

The main budget drivers include the following:

- Administration – This category covers the internal labor necessary for advertising and promotion marketing campaigns.
- Advertising and Promotion – These funds are spent directly on the Company's advertising and promotional strategies to support individual programs and cross-marketing among programs.

Application Development and Maintenance

Description
The Application Development and Maintenance (ADM) budget supports the Company's extensive data and process management software, hardware and tools necessary to market manage and deliver energy efficiency programs and report program achievement. The ADM budget supports several different computers and cloud-based systems. These systems require regular maintenance and sometimes new functionality in order to ensure our customer's data privacy is protected as well as ensure accurate reporting of the portfolio's achievement and customer participation.

The ADM budget allows the Company to perform enhancements and system updates to our current systems to maintain the quality of our reporting. These changes are necessary to ensure reporting flexibility and efficiencies, improve back-office processes, and improve process management.

ADM is an internal Information Technology (IT) program to support the Company's software, maintenance data and reporting capabilities. As an indirect program in the Planning Segment, this program is an internal only budget and is not marketed to customers.

The Company's ADM work is performed by a combination of in-house software developers and system administrators, and by contracted external resources. The budgets for this work represent software purchases and the labor required to configure the software to integrate with existing systems and processes.

Program Changes
None.

Budget and Goal Considerations
Administration – these budgets were developed using historical trends for existing system maintenance work. As well as identifying project-specific funding needed for new system development and enhancement work to ensure that the Company is up to date on advances in technology, and the associated costs. The increased budget is needed to ensure our ability to keep our existing systems and processes at optimum performance. The expenditures for the portfolio included internal and external labor, software licenses, and application development and maintenance are covered by this budget category.

CIP Training

Description
The CIP Training program allows the Company's staff within marketing, engineering, regulatory, operations and sales the opportunity for continued education and training to grow energy efficiency. These education opportunities include learning more about electric and natural gas energy efficient related equipment as well as new advances in technology and changes in the energy efficiency industry. These trainings are necessary to enhance the Company's knowledge base for current staff as well as getting new staff up to speed on energy efficiency. The Company's staff may attend internal or external training sessions, conferences and seminars on various technologies, industry best practices, and energy efficiency and conservation growth topics. Continued education enables us to stay current on the energy efficiency industry in addition to keeping informed about future technologies and industry trends that will ultimately better serve our customers. The CIP training budget allows us to overcome future challenges and help us meet goals.

The CIP Training program is an internal program to support the Company's training efforts to keep the staff aware of new technologies and transformations to support growth in the energy efficiency industry. As an indirect program in the Planning Segment, this program is an internal only budget and is not marketed to customers.

The program budget was developed by evaluating historical spending for staff to attend both internal and external conferences and seminars on energy efficiency.

Program Changes
None.

Budget and Goal Considerations
Administration – This budget was developed using historical trends for the past three years of training related expenses. Expenses covered under this budget include internal and external labor, materials and travel expenses for the Company's staff to attend internal and external conferences, seminars and training sessions.

Partners in Energy

Description
Partners in Energy drives participation to direct impact programs by supporting the development and implementation of energy action plans for the communities served by Xcel Energy. By leveraging local resources through the customization and delivery of each community's marketing we are successful in delivering targeted messaging that reaches new markets and motivates participants to support local initiatives while saving energy and money.

The Partners in Energy program offers customized support that reflects the unique needs of the communities we serve. Through the application and intake process, planning needs are identified. Implementation support is based on the needs and gaps identified through the development of the plan. The program is primarily marketed through our Community Relations Managers and "word of mouth" among sustainability staff in the cities and counties served by Xcel Energy.

The program's main offerings include the following:

- Support for energy action plan development;
- Support for energy action plan implementation; and
- Ongoing education and networking
    - Online content delivery around trending topics and case studies;
    - In-person educational events to promote networking and collaboration; and
    - Online portal to support access to work products and materials to support community level energy programming and initiatives.

Applications for Partners in Energy are normally accepted in January and July each year. The main offerings are described in further detail below.

<u>Plan Development</u>

The resources and objectives for developing an energy action plan are unique to the staff and members of an individual community. The resources provided through Partners in Energy are designed to capture that by focusing on leveraging a local stakeholder team to build the plan. These teams can include residents, businesses, staff and representatives from local non-profits or business groups. The plan development phase is normally 4-6 months in duration depending on variables such as team schedule or the complexity of the plan being produced.

Resources provided through Partners in Energy to support plan development include:

- Tools and resources to form a planning team;
- Professionally facilitated workshops to develop plan content;
- Data to inform baseline use of energy and programs, and community information to provide background necessary to identify target segments or energy saving opportunities;
- Development and editing of a plan document; and
- Project management.

<u>Plan Implementation</u>

Activities during the implementation phase of Partners in Energy are driven from the strategies and tactics identified from the local stakeholder team during plan development. Support for implementation of the plan normally spans about 18 months. The objective is to help the community achieve some short-term goals and develop the resources to continue to implement the plan to achieve longer term objectives. The implementation phase may be extended if there is interest from the community and the resources provided through the program are driving program participation with the local businesses or residents.

The resources provided through Partners in Energy are designed to supplement those provided by the community and fill potential gaps. Manpower to deliver on the plan tactics is normally the thing that defines how aggressive a community can be with implementation plans.

Resources provided through Partners in Energy to support plan implementation include:

- Development of co-branded marketing collateral for education and outreach;
- Data to track progress to goals;
- Recognition and support for community-wide achievements;
- Potential identification and integration of third-party resources such as community energy organizations; and
- Project management.

Ongoing Education and Networking

Since it's initiation in 2014, Partners in Energy has evolved to be a resource for energy information for the communities it serves. This has included providing resources to help them save energy at their facilities, leverage Xcel Energy conservation programs to drive savings with their residents and businesses and sharing best practices from both local and national case studies. These resources are designed to address topics that are timely but aren't necessarily tailored to any individual community's needs.

Both the delivered information and the channels of communication are focused on communities as the audience. In addition to sharing communication with these communities, this component of the offering frequently incorporates opportunities for networking, encouraging participants to share their successes and failures as they have worked to develop and implement their energy action plans.

Resources provided through Partners in Energy to support community education and networking include:

- Online content delivery through webinars and newsletters;
- In-person events with subject matter experts and panel discussions; and
- Community web portal.

Program Changes

This is the first time this program has been filed. Previous conservation expenses were tracked through the Advertising and Promotion.

Budget and Goal Considerations

The program budget assumes support of 6-9 energy action plans annually. There are also funds for continued support of successful implementation efforts and the development and delivery of community level outreach and education at the in-person and online events.

The Partners in Energy program is focused on energy action plans where the content is defined by the communities served. These plans are not limited to conservation. Costs associated with activities outside the scope of this filing are paid through alternate funding mechanisms within the Company.

The main budget driver is:

- Consultant support for program delivery – Xcel Energy engages a third party to provide delivery services for this program and support services throughout planning and implementation. This team provides comprehensive services including:
    - Insights into local government planning;
    - Collateral development;
    - Data analysis and presentation; and
    - Energy action plan development.

Regulatory Affairs

Description
Regulatory Affairs manages all of the Company's DSM regulatory filings, directs and prepares cost-benefit analyses, provides results of energy conservation achievements, manages electric and gas potential studies, and analyzes and prepares cost recovery reports. The group also provides procedures for effectively addressing requirements for the DSM regulatory process. These functions are needed to ensure a cohesive and high-quality DSM portfolio that meets legal requirements, as well as the expectations of Xcel Energy's customers, regulators, and staff.

In addition, Regulatory Affairs supports the DSM component of resource planning, rate cases, and certificates of need, and provides strategic evaluation planning and internal policy guidance. These functions are needed to ensure the cost-effectiveness of DSM, to ensure the quality of DSM impact estimates, help generate ideas for future DSM projects, establish programmatic consistency, and manage DSM-related marketing information.

Program Changes
None.

Budget and Goal Considerations
Program budgets were developed based on historical spending. Included in the Regulatory Affairs budgets are materials, administration, and outside consulting costs. Budgets have increased slightly to recognize we spent most, or exceeded, of what was budgeted in the Company's previous Plan.

The main budget drivers include the following:

- Administration – This budget category covers the internal labor and materials, software fees, and outside consulting and contracting necessary to deliver all CIP-related regulatory filings in Minnesota.

Involvement of Community Energy Organizations
The Regulatory Affairs group works with third-party alternative filers, community organizations, and other interested parties as applicable. In addition, we regularly attend energy efficiency stakeholder meetings and assist with legislative policy.

Research, Evaluations, & Pilots Segment

Description
The Research, Evaluations, and Pilots Segment includes indirect research and development efforts that are not directly affiliated with a specific direct impact program. This Segment provides research, evaluation, and screening of new DSM products and concept testing.

Under this Segment, Market Research and Product Development:

- Evaluates achieved energy and demand savings;
- Quantifies the various levels of market potential for programs;
- Analyzes overall effects of Xcel Energy's CIP portfolio on customer usage and overall system peak demand and system energy usage;
- Develops new DSM programs;
- Researches, pilots, and monitors new conservation products to determine conservation opportunity;
- Provide overall informational support for DSM;
- Evaluate the processes and impacts of DSM Programs;
- Measure overall customer satisfaction with Xcel Energy's various DSM efforts;
- Provide segment and target market information; and,
- Examine in further depth the various assumptions used within program design and management.

Portions of this Segment are subject to the Research and Development spending cap of 10 percent of our minimum-spending requirement. For the most part, Market Research projects fall outside of Research & Development, except for market potential studies, as the information is not intended exclusively to assist in developing new programs and mainly addresses existing programs through efforts such as program evaluations. All of Product Development projects and costs are included within the R&D category and subject to the cap, except for pilot programs.

Programs
This Segment is comprised of the Market Research and Product Development teams.

Overall Goals
The budgets for Market Research and Product Development were based on past spending and adjusted for planned expenditures. Pilot projects may be proposed as either direct or indirect impact. Two pilots are included in this Extension Plan and savings related to these pilots are presented in the following table:

	Electric				Gas		
Program Year	**Participation**	**Budget**	**Gen kW**	**Gen kWh**	**Participation**	**Budget**	**Dth**
2021	N/A	$6,455,634	N/A	N/A	N/A	$421,107	N/A
2022	N/A	$6,516,523	N/A	N/A	N/A	$429,965	N/A
2023	N/A	$7,037,858	N/A	N/A	N/A	$501,621	N/A

Market Analysis
Not applicable.

Marketing/Advertising/Promotion
Not applicable.

Overall Policies
Not applicable.

Involvement with Interested Individuals and Entities
We involve external parties (government, manufacturers, vendors, installers) in our product development process. We also seek the input of manufacturers, vendors, and installers as we build the technical assumptions for each product in order to test for cost effectiveness.

Market Research

Description
Market Research drives a variety of CIP-specific projects that are used to support effective design and implementation of DSM programs and services. This enhances understanding of current and potential customers, market segmentation, and engagement drivers. Additional research is conducted through procurement of third-party consultants who review primary and secondary data while purchased market research subscriptions offer energy efficiency and/or marketing resources that provide strategic information regarding customers, DSM products, and business direction for Xcel Energy DSM efforts. This research falls into two categories:

- Program Support Activities which primarily provide overall DSM informational support for several programs or segments; and
- Program and Portfolio Evaluations which provide process and / or impact studies of products or groups of products and characterizing and/or modeling of market potential for adoption of energy efficiency measures.

Although research needs may change during the Plan, we plan to continue the procurement of the following market research resources in 2021, 2022, and 2023:

- Program Support Activities
    - E Source membership provides unbiased, objective research and advisory services that help advance efficiency programs, improve the customer experience, and use energy more efficiently.
    - Dun & Bradstreet list purchase provides specific demographic information helpful in effectively identifying potential business customers capable of benefiting from existing and planned DSM programs.
    - Data purchase and development and maintenance of an energy-focused segmentation system to assist in marketing energy efficiency to residential customers
    - Home Use Study provides valuable information regarding saturation of various home appliances and technologies in residential homes.
    - Residential and Business Advertising Tracking data ensures the effectiveness and reach of DSM advertising efforts by asking customers reactions and recall of specific campaigns.
- Program and Portfolio Evaluations
    - Comprehensive program evaluations are completed by independent third-party consultants for specific programs each year. The Company establishes the evaluation priorities based on several factors including program budgets, savings, time since previous evaluations, and strategic role of programs within the portfolio. In 2021 and 2022 the Company will also investigate and in 2023 may initiate a portfolio evaluation approach that would establish metrics (in addition to Dth, kWh, kW, and participation) to track program performance in between the in-depth evaluations that are listed below. The Company plans to conduct the following program-specific evaluations during the Plan:
        - 2021

            Commercial Efficiency and Process Efficiency (combined evaluation)
            Compressed Air Efficiency;
            Low-Income Segment (commence two-year evaluation, complete in 2022)

- 2022
  - Home Energy Insights
  - Home Energy Squad
  - Lighting
  - Low-Income Segment (continue/complete from 2021)
- 2023
  - Custom Efficiency
  - Residential Heating and Cooling (focused on residential heating measures)
  - Business Energy Assessments

- The Company has assumed a modest potential study update or other sector specific saturation and adoption modeling will be needed in anticipation of a future Upper Midwest Integrated Resource Plan (IRP). Since the current IRP has not been decided, it is unknown what research may be ordered by the Commission and when that future IRP will be filed.

Program Changes
None.

Budget and Goal Considerations
The Market Research budget was developed based on historical project costs for similar research and /or studies of similar scope.

The main budget drivers include the following:

- Purchased/subscription data and research;
- Third party evaluation and research consulting; and
- Administration which covers the internal staff and external professional services needed for project planning and implementation.

Involvement of Community Energy Organizations
Not applicable.

Measurement & Verification

This section documents our efforts to measure and verify direct-savings of electric and gas programs to ensure that reported savings are as accurate as possible while balancing measurement and verification (M&V) robustness against cost. M&V costs have been budgeted within each program's overall budget.

Prescriptive projects are subjected to realization rates, a calculated metric that compares verified savings with reported savings, then is applied to all reported program savings to come up with total program impacts. Custom projects all adhere to pre-established M&V policy and threshold under Docket Number E, G999/CIP-06-1591. For programs not specifically listed in this document, project M&V is not conducted due to budgetary or logistical constraints but may be validated in periodic program evaluations.

- **Rebate Application Validation (All Programs)**

  Step 1: Applications are validated prior to data entry and sent back to the customer or account manager if any data is missing or incorrect.

  Step 2: Daily audit is conducted on all rebates after data entry but before rebate is issued. Errors are corrected and rebate is paid.

- **Measurement & Verification (General)**

  Verifies on an ongoing basis during performance year the gross energy and demand savings.
  - **Prescriptive programs** using deemed savings technical assumptions have random sample field inspections to verify that the measure is installed and operating, and the key parameters of the technical assumption match the rebate.
  - **Custom programs** go through stages of engineering review of the savings calculations. Random samples are sent to an outside engineering firm for further review. Projects with savings greater than 1 GWh or 20,000 Dth are pre- and post-metered, as are some projects that are metered at engineering discretion to verify assumptions for new technologies or other variables.
  - **Exception programs** conduct M&V as it makes sense from a financial, accuracy, logistical and customer investment standpoint.

Prescriptive Process

For most of the programs, the verification contractor selects a statistically valid number of projects to verify through field inspections or phone surveys. The sample size is designed to achieve accuracy levels of between 10 percent and 20 percent given a confidence level of 90 percent around the realization rate and is weighted to select larger projects. The number of randomly selected participants in the sample may increase or decrease during the year depending on program participation to ensure precision goals for the program. Sampling bias caused by poor response rates and deliberate exclusion of sample projects is reduced through a quality control process. Rebate forms notify all customers that their respective premises and measures are subject to verification inspections.

The process is as follows:

Step 1: Customer submits rebate application and required documentation to the Company after measure is installed.

Step 2: Rebate Operations reviews all business and residential program rebate applications, supporting documentation, and vendor invoices. They check the customer information, equipment eligibility and proper rebate amounts. If information is missing or incorrect, the application is sent back to the account representative or customer to make changes.

Step 3: If project qualifies for rebate, Rebate Operations enters rebate application form data into the rebate tracking system and authorizes rebate payment. Prior to authorizing rebates, all applications are verified in a daily audit.

Step 4: On a monthly basis the third-party verification contractor (VC) pulls a list of all projects completed during the previous month.

Step 5: VC selects random samples, notifies the Company of the sample selections, and manages statistically valid sample process to achieve a 90% confidence level with 10% precision.

If it is not possible to achieve 90/10, a confidence and precision level of 90/20 is acceptable.

Step 6: VC contacts customer to schedule the inspection.

Step 7: VC visits site and verifies the savings factors and equipment information for that measure.

Step 8: VC documents discrepancies and submits report to the Company.

Step 9: Product management and technical staff evaluate the nature of the discrepancy and take appropriate follow-up actions.

Step 10: Step 11: Corrective action such as communication of program requirements, changes to program rules or identification of intentional misuse of the programs are undertaken based on these audit results as necessary.

Applicable Prescriptive Programs

Including prescriptive projects of programs with prescriptive and custom components.

Business Programs

- Business Energy Assessments;
- Commercial Efficiency;
- Commercial Streamlined Assessment;
- Compressed Air Efficiency;
- Data Center Efficiency;
- HVAC+R;
- Lighting; and
- Process Efficiency.

Residential Programs

- Insulation Rebate;
- Low-Income Home Energy Savings;
- Multi-Family Energy Savings;
- Residential Heating and Cooling; and
- Residential Demand Response (Smart Thermostat measures).

Programs and/or Components with Variation from Prescriptive Process

- **The Boiler Tune-Up and Tune-Up Plus** measures in the HVAC+R program do not have audits performed.
- **Business New Construction - Energy Efficient Buildings (EEB) component**, EEB differs from the prescriptive process in that preapproval is required prior to equipment install, invoices are not required, and all projects are field verified by the third party implementer.
- **Home Energy Insights, Whole Home Efficiency, Home Energy Squad, Low-Income Home Energy Squad, Refrigerator Recycling**, **Multi-Family Building Efficiency,** the third-party implementers are responsible for ensuring verification of measures.
- For **Efficient New Home Construction**, 100 percent of homes are verified through the Residential Energy Services Network (RESNET) rating and quality assurance protocols.
- For **Home Lighting**, all retailers provide sales data on quantity and type of bulbs sold.
- Select programs utilize third-party program implementers or survey companies to complete follow-up surveys to a sample of the participants to confirm and track whether the equipment was installed. An installation rate is applied to the program's annual savings.
- For **School Education Kits**, participants conduct and submit surveys.
- For **Energy Efficient Showerheads** program, third-party implementer reports on quantity of showerheads distributed. The third-party survey company reports on installation rates.

General Custom Process

Project Identification

Step 1: Project identification and scoping.
Step 2: Customer submits preapproval application to the Company.

Preapproval

Step 3: An engineer (or outside engineering firm) reviews the application and calculates the energy and demand savings based on the technical assumptions specific to that measure and the resulting rebate.
Step 4: Xcel Energy engineers review the calculations, regardless of whether internal or external engineers completed Step 3.
Step 5: We select a random sample of committed projects and send this list to an outside engineering firm (if Xcel Energy engineer performed Step 3) to review the calculations.
Step 6: If the outside engineering firm disagrees with our engineer's analysis, they discuss the project and reach a consensus on the calculations.
Step 7: We send out a preapproval or rejection letter stating the preapproved demand and energy savings along with the rebate amount.

Monitoring

Step 8: If monitoring is needed, an Xcel Energy engineer drafts an M&V plan and sends a monitoring agreement for customer review and approval signature.
Step 9: If the customer does not have the appropriate meter structure, a third-party engineering firm installs metering equipment and collects the pre-data as set forth in the monitoring

agreement.

Step 10: After the designated pre-monitoring period, the customer completes the project installation and contacts the account manager.

Step 11: The third-party engineering firm collects post-installation monitoring data and sends pre- and post-data to the Company.

Site Verification

Step 12: For managed accounts, the customer's account manager works with the customer to verify project installation and removal of old equipment and obtain invoices or alternate cost documentation for submission to our DSM staff.

Approval and Rebate Payment

Step 13: For non-monitored projects, the invoices are reviewed and if the installed measure specifications match the proposed measure specifications, then the preapproved rebate is awarded. If project incremental costs changed by >10%, or the scope changed, the project is reevaluated (return to Step 3).

Step 14: For monitored projects, an engineer (or third-party engineering firm) determines actual savings based on monitoring results.

Step 15: For monitored projects, if an Xcel Energy engineer completes the analysis, 100% of projects are sent to third-party engineering firm for review.

Step 16: If the third-party engineering firm disagrees with our engineer's analysis, they discuss the project and reach consensus on the calculations.

Step 17: For monitored projects, if the incremental cost and savings (customer Dth, customer kW savings, and customer kWh) vary by <= 10% of the preapproved estimated savings, the preapproved rebate is
paid and the monitored savings and actual costs are claimed.
A new analysis is conducted if the actual
savings vary by >10%. The rebate paid is based on actual savings, and we claim the post-monitored results.

Step 18: Project savings are reported in the year that the rebate is awarded.

Applicable Custom Programs

Including custom and behavioral projects of programs with these components.

- Commercial Efficiency;
- Commercial Streamlined Assessment;
- Compressed Air Efficiency;
- Custom Efficiency;
- Data Center Efficiency;
- Efficiency Controls;
- HVAC+R;
- Lighting; and
- Process Efficiency.

Exceptions

Programs with special design elements are verified using processes unique to the program. The

M&V process for these products is described below.

Business New Construction – We contract with a third-party consultant to develop the energy efficiency recommendations and M&V. Field verification is performed to ensure that the strategies are installed per the design intent. The rebate is not paid until savings are verified.

The following process shows the steps taken throughout the EDA process to ensure proper installation and energy savings:

Step 1: Application submittal.
Step 2: Meetings take place with the customer and design team.
Step 3: Consultant completes energy modeling to identify conservation packages.
Step 4: Construction documents are reviewed for measures identified through the energy model. The design team and customer are notified whether these measures were found within these documents. (Enhanced Track only)
Step 5: The customer completes construction.
Step 6: Consultant visits site and verifies that specified measures were installed. Selected equipment and systems are monitored for a two-week timeframe, as appropriate, to evaluate performance variables against modeling assumptions.
Step 7: For projects with individual measures that have savings greater than or equal to 1.0 GWh or 20,000 Dth per year, the individual measures must be considered "selected equipment" as defined in Step 6 above.
Step 8: The actual results are used to determine the final rebate.
Step 9: Rebate is issued to customer based on final savings.

Business Energy Assessments, Heating and Study Driven Program (general process)
The customer hires an engineering firm to conduct a study of the building to determine energy savings for each measure. An Xcel Energy engineer then reviews and verifies 100 percent of the identified opportunities for savings calculation accuracy prior to approving and paying a rebate for the study.

When opportunities are implemented, an Xcel Energy engineer verifies that the implemented measures match what was approved and edits any changes implemented that do not exactly match the approved study. For Business Energy Assessments, the customer needs to notify us when this happens. For other programs, the quantity/equipment detail on the invoices may be used.

Self-Direct Program
Qualifying customers submit M&V plans with their applications. M&V plans, which may include pre-installation monitoring, are reviewed and approved by an Xcel Energy engineer (or outside engineering firm).

Load Management
Electric Rate Savings
Customer participation and compliance is verified via the specialized meters deployed. This allows us to confirm the amount of load shed at each control event.

Residential Demand Response and Commercial AC Control

The Residential Demand Response (Saver's Switch and AC Rewards) and Commercial AC Control programs contract with a third-party to conduct annual load research on a sample of participant sites. This research measures the amount of load relief realized when a control is implemented.

In territories where the automated meter reading system is available, we can test residential Saver's Switches remotely to identify sites with failed switches. We anticipate continuing this process annually going forward to ensure a healthy switch population.

Product Development

Description
CIP Product Development identifies, assesses, and develops new energy efficiency and demand response products and services for eventual inclusion as new CIP programs, products, and measures. This work enables Xcel Energy to stay current and advance important new energy saving technologies for customers. The group also develops improvements to existing products.

The product development process begins with ideas for new energy conservation measures from customers, regulators, energy professionals, Xcel Energy staff, and others. Before a new product is approved, the group researches new ideas, evaluates them for savings potential, screens, and sometimes tests specific product ideas as we work through the development process.

During this triennial period, Product Development will continue to develop new products and expand existing products to help meet Xcel Energy's conservation goals. Products or programs are selected for development based on several criteria including, but not limited to, energy efficiency potential, level of effort to development, longevity of the offering (i.e. how long until a product becomes the industry standard), market barriers, and risk (technological, market) among others.

Program Changes
None.

Budget and Goal Considerations
Product Development is an indirect-impact program and, therefore, generally does not set any participation or energy savings goals. Product Development, on occasion, develops pilots with savings goals. We seek approval to claim direct-impact savings in those cases. The program budgets were developed by reviewing historical program expenditures and estimating the time involved in completing future efforts.

The main budget drivers include the following:

- R&D – This category funds internal Product Development staff.
- Administration – Product Development contracts with external consultants to assist in project planning and implementation.

Involvement of Community Energy Organizations
Not applicable.

Assessments

Description
The Assessments Segment accounts for monetary assessments from the Minnesota Department of Commerce. Minn. Stat. § 216B.241, subd(s). 1d, e and f assess each utility a fee for technical assistance, applied research and development grants, and facility energy efficiency.

Program Changes
Not applicable.

Budget and Goal Considerations and Participation Development
Budgets for this Plan were developed based on the direct and indirect assessment invoices received during the 2017-2019 CIP Triennial Plan and 2020 CIP Extension Plan period.

The main budget drivers include the following:

- Other – All CIP-related regulatory assessments are budgeted to this category.

Involvement of Community Energy Organizations
Not applicable.

Electric Utility Infrastructure

Description
The Minnesota Next Generation Energy Act of 2007 ("Act") created the opportunity for an electric utility to claim savings from projects that improve the efficiency of the utility's infrastructure or system towards its electric savings goal, provided that the utility files a plan to achieve savings of at least one percent of retail sales through direct energy conservation programs. The Act also authorized a new rate schedule for recovery of electric utility infrastructure project costs, but does not require that a utility create a specific rate schedule in order to claim the related energy savings.

Electric utility infrastructure ("EUI") projects are defined in Minn. Stat. § 216B.1636 as electric utility-owned projects that:

1) Replace or modify existing electric utility infrastructure, including utility-owned buildings, if the replacement or modification is shown to conserve energy or use energy more efficiently, consistent with section 216B.241, subd. 1c; or,
2) Conserve energy or use energy more efficiently by using waste heat recovery converted into electricity as defined in section 216B.241, subd. 1, paragraph (n).

Minn. Stat. § 216B.241, subd. 1c, also clarifies that EUI projects "must result in increased energy efficiency greater than that which would have occurred through normal maintenance activity." Sample projects include distribution system improvements that reduce line losses and heat rate improvements that increase the efficiency of energy production, such as process optimization and equipment design modifications.

In addition to contributing towards our CIP goals, EUI projects typically have the following benefits:

- Direct energy consumption savings;
- Reduced maintenance costs;
- Extended equipment life; and,
- Better power plant performance.

The energy savings translate to less natural gas or coal that is needed to produce electricity, which reduces greenhouse gas emissions and fuel costs, thereby lowering the environmental impact and overall cost of generation.

Because we are expecting to meet and exceed the 1.5 percent goal through customer programs, EUI projects will likely play a small role in this Plan. However, savings from EUI projects may become increasingly important over time if the savings potential from traditional programs continues to decline.

Given the minor role expected for EUI in this Plan and uncertainties in project funding and timing, we are not proposing specific savings goals or budgets for this Segment. Should we complete any EUI projects during the Plan period, we will report the results in our annual CIP Status Report and will follow the Department's EUI policy guidance.

Program Changes
None.

Budget and Goal Considerations
As discussed earlier, we are not proposing any budgets or savings goals for this segment.

Involvement of Community Energy Organizations
In 2017, the Company and other stakeholders participated in the Department's EUI stakeholder process in order to better understand existing state policies concerning EUI, examine incentives/disincentives to improving EUI efficiency, and recommend policy changes or clarifications to leverage EUI efficiency to help meet Minnesota's efficiency goals.

PORTFOLIO TOTAL

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$98,636,913	$98,636,913	$98,636,913	$116,076,693
T & D	N/A	$14,330,177	$14,330,177	$14,330,177	$17,120,235
Marginal Energy	N/A	$189,626,934	$189,626,934	$189,626,934	$235,162,230
Environmental Externality	N/A	N/A	N/A	N/A	$34,607,438
Subtotal	N/A	$302,594,024	$302,594,024	$302,594,024	$402,966,596
Participant Benefits					
Bill Reduction - Electric	$966,504,123	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$46,325,732	N/A	N/A	$46,325,732	$46,325,732
Incremental Capital Savings	$320,890	N/A	N/A	$320,890	$299,713
Incremental O&M Savings	$98,102,866	N/A	N/A	$98,102,866	$120,047,682
Subtotal	$1,111,253,611	N/A	N/A	$144,749,488	$166,673,128
Total Benefits	$1,111,253,611	$302,594,024	$302,594,024	$447,343,512	$569,639,724
Costs					
Utility Project Costs					
Customer Services	N/A	$4,122,882	$4,122,882	$4,122,882	$4,122,882
Project Administration	N/A	$41,403,218	$41,403,218	$41,403,218	$41,403,218
Advertising & Promotion	N/A	$8,762,669	$8,762,669	$8,762,669	$8,762,669
Measurement & Verification	N/A	$2,099,309	$2,099,309	$2,099,309	$2,099,309
Rebates	N/A	$46,325,732	$46,325,732	$46,325,732	$46,325,732
Other	N/A	$373,520	$373,520	$373,520	$373,520
Subtotal	N/A	$103,087,331	$103,087,331	$103,087,331	$103,087,331
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$966,504,123	N/A	N/A
Subtotal	N/A	N/A	$966,504,123	N/A	N/A
Participant Costs					
Incremental Capital Costs	$158,033,301	N/A	N/A	$158,033,301	$157,500,400
Incremental O&M Costs	$6,452,692	N/A	N/A	$6,452,692	$7,851,051
Subtotal	$164,485,992	N/A	N/A	$164,485,992	$165,351,451
Total Costs	$164,485,992	$103,087,331	$1,069,591,454	$267,573,323	$268,438,781
Net Benefit (Cost)	**$946,767,619**	**$199,506,694**	**($766,997,430)**	**$179,770,189**	**$301,200,943**
Benefit/Cost Ratio	**6.76**	**2.94**	**0.28**	**1.67**	**2.12**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.8 years
T & D Loss Factor (Energy)	7.00%
T & D Loss Factor (Demand)	8.64%
Net coincident kW Saved at Generator	0.10 kW
Gross Annual kWh Saved at Customer	349 kWh
Net Annual kWh Saved at Generator	372 kWh

Program Summary All Participants	
Total Participants	**1,704,381**
Total Budget	**$103,087,331**
Net coincident kW Saved at Generator	**172,315 kW**
Gross Annual kWh Saved at Customer	594,655,653 kWh
Net Annual kWh Saved at Generator	**633,990,768 kWh**

Utility Program Cost per kWh Lifetime	**$0.0103**
Utility Program Cost per kW at Gen	**$598**

PORTFOLIO TOTAL

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$101,406,391	$101,406,391	$101,406,391	$60,376,727
T & D	N/A	$14,530,833	$14,530,833	$14,530,833	$17,336,877
Marginal Energy	N/A	$198,621,479	$198,621,479	$198,621,479	$246,069,555
Environmental Externality	N/A	N/A	N/A	N/A	$42,355,603
Subtotal	N/A	$314,558,703	$314,558,703	$314,558,703	$366,138,762
Participant Benefits					
Bill Reduction - Electric	$983,600,661	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$46,738,419	N/A	N/A	$46,738,419	$46,738,419
Incremental Capital Savings	$337,147	N/A	N/A	$337,147	$321,470
Incremental O&M Savings	$98,312,308	N/A	N/A	$98,393,354	$120,372,706
Subtotal	$1,128,988,535	N/A	N/A	$145,468,920	$167,432,595
Total Benefits	$1,128,988,535	$314,558,703	$314,558,703	$460,027,623	$533,571,357
Costs					
Utility Project Costs					
Customer Services	N/A	$4,410,069	$4,410,069	$4,410,069	$4,410,069
Project Administration	N/A	$43,308,344	$43,308,344	$43,308,344	$43,308,344
Advertising & Promotion	N/A	$8,893,414	$8,893,414	$8,893,414	$8,893,414
Measurement & Verification	N/A	$2,031,278	$2,031,278	$2,031,278	$2,031,278
Rebates	N/A	$46,738,419	$46,738,419	$46,738,419	$46,738,419
Other	N/A	$386,991	$386,991	$386,991	$386,991
Subtotal	N/A	$105,768,516	$105,768,516	$105,768,516	$105,768,516
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$983,600,661	N/A	N/A
Subtotal	N/A	N/A	$983,600,661	N/A	N/A
Participant Costs					
Incremental Capital Costs	$157,395,124	N/A	N/A	$157,395,124	$156,854,785
Incremental O&M Costs	$6,115,845	N/A	N/A	$6,115,845	$7,438,350
Subtotal	$163,510,969	N/A	N/A	$163,510,969	$164,293,135
Total Costs	$163,510,969	$105,768,516	$1,089,369,177	$269,279,484	$270,061,651
Net Benefit (Cost)	**$965,477,566**	**$208,790,187**	**($774,810,474)**	**$190,748,138**	**$263,509,706**
Benefit/Cost Ratio	**6.90**	**2.97**	**0.29**	**1.71**	**1.98**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.6 years
T & D Loss Factor (Energy)	7.00%
T & D Loss Factor (Demand)	8.57%
Net coincident kW Saved at Generator	0.11 kW
Gross Annual kWh Saved at Customer	355 kWh
Net Annual kWh Saved at Generator	378 kWh

Program Summary All Participants	
Total Participants	**1,669,180**
Total Budget	**$105,768,516**
Net coincident kW Saved at Generator	**190,512 kW**
Gross Annual kWh Saved at Customer	592,578,298 kWh
Net Annual kWh Saved at Generator	**631,482,415 kWh**

Utility Program Cost per kWh Lifetime	**$0.0107**
Utility Program Cost per kW at Gen	**$555**

PORTFOLIO TOTAL

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$104,037,968	$104,037,968	$104,037,968	$61,566,351
T & D	N/A	$14,707,945	$14,707,945	$14,707,945	$17,523,715
Marginal Energy	N/A	$210,360,463	$210,360,463	$210,360,463	$259,982,737
Environmental Externality	N/A	N/A	N/A	N/A	$34,738,526
Subtotal	N/A	$329,106,377	$329,106,377	$329,106,377	$373,811,329
Participant Benefits					
Bill Reduction - Electric	$1,002,897,550	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$47,359,931	N/A	N/A	$47,359,931	$47,359,931
Incremental Capital Savings	$358,006	N/A	N/A	$358,006	$324,897
Incremental O&M Savings	$98,748,384	N/A	N/A	$98,748,384	$120,774,633
Subtotal	$1,149,363,871	N/A	N/A	$146,466,321	$168,459,460
Total Benefits	$1,149,363,871	$329,106,377	$329,106,377	$475,572,698	$542,270,789
Costs					
Utility Project Costs					
Customer Services	N/A	$4,675,422	$4,675,422	$4,675,422	$4,675,422
Project Administration	N/A	$45,029,590	$45,029,590	$45,029,590	$45,029,590
Advertising & Promotion	N/A	$9,029,980	$9,029,980	$9,029,980	$9,029,980
Measurement & Verification	N/A	$2,233,375	$2,233,375	$2,233,375	$2,233,375
Rebates	N/A	$47,359,931	$47,359,931	$47,359,931	$47,359,931
Other	N/A	$649,498	$649,498	$649,498	$649,498
Subtotal	N/A	$108,977,795	$108,977,795	$108,977,795	$108,977,795
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$1,002,897,550	N/A	N/A
Subtotal	N/A	N/A	$1,002,897,550	N/A	N/A
Participant Costs					
Incremental Capital Costs	$158,494,010	N/A	N/A	$158,494,010	$157,935,632
Incremental O&M Costs	$5,983,132	N/A	N/A	$5,983,132	$7,269,029
Subtotal	$164,477,143	N/A	N/A	$164,477,143	$165,204,661
Total Costs	$164,477,143	$108,977,795	$1,111,875,345	$273,454,938	$274,182,456
Net Benefit (Cost)	**$984,886,728**	**$220,128,582**	**($782,768,968)**	**$202,117,760**	**$268,088,333**
Benefit/Cost Ratio	**6.99**	**3.02**	**0.30**	**1.74**	**1.98**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.5 years
T & D Loss Factor (Energy)	7.00%
T & D Loss Factor (Demand)	8.56%
Net coincident kW Saved at Generator	0.13 kW
Gross Annual kWh Saved at Customer	357 kWh
Net Annual kWh Saved at Generator	380 kWh

Program Summary All Participants	
Total Participants	**1,653,800**
Total Budget	**$108,977,795**
Net coincident kW Saved at Generator	**208,813 kW**
Gross Annual kWh Saved at Customer	590,594,663 kWh
Net Annual kWh Saved at Generator	**629,026,930 kWh**

Utility Program Cost per kWh Lifetime	**$0.0111**
Utility Program Cost per kW at Gen	**$522**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **Portfolio Total**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$9,361,902	$9,783,855	$10,515,735
Incentive Costs =	$8,439,656	$8,730,367	$8,879,754
16) Total Utility Project Costs =	$17,801,557	$18,514,222	$19,395,489
17) Direct Participant Costs ($/Part.) =	$55	$58	$59
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$50	$54	$58
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	13.8	13.6	13.6
21) Avg. Dth/Part. Saved =	1.53	1.62	1.66
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	622,810	624,181	622,438
24) Total Annual Dth Saved =	950,939	1,013,369	1,033,152
25) Incentive/Participant =	$13.55	$13.99	$14.27

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$29	$30	$31
Cost per Participant per Dth =	$55	$54.00	$54.13
Lifetime Energy Reduction (Dth)	40,973,260		
Societal Cost per Dth	$4.01		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($123,133,678)	0.59
Utility Cost Test	$120,866,848	3.17
Societal Test	$259,460,331	2.58
Participant Test	$257,698,479	3.41

BUSINESS SEGMENT EE AND DR TOTAL

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$58,919,894	$58,919,894	$58,919,894	$69,581,018
T & D	N/A	$9,342,649	$9,342,649	$9,342,649	$11,194,559
Marginal Energy	N/A	$131,673,800	$131,673,800	$131,673,800	$163,070,266
Environmental Externality	N/A	N/A	N/A	N/A	$24,260,226
Subtotal	N/A	$199,936,343	$199,936,343	$199,936,343	$268,106,069
Participant Benefits					
Bill Reduction - Electric	$594,384,517	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$32,445,849	N/A	N/A	$32,445,849	$32,445,849
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$93,889,520	N/A	N/A	$93,889,520	$115,288,221
Subtotal	$720,719,886	N/A	N/A	$126,335,369	$147,734,070
Total Benefits	$720,719,886	$199,936,343	$199,936,343	$326,271,712	$415,840,138
Costs					
Utility Project Costs					
Customer Services	N/A	$3,354,065	$3,354,065	$3,354,065	$3,354,065
Project Administration	N/A	$16,238,204	$16,238,204	$16,238,204	$16,238,204
Advertising & Promotion	N/A	$756,310	$756,310	$756,310	$756,310
Measurement & Verification	N/A	$1,022,200	$1,022,200	$1,022,200	$1,022,200
Rebates	N/A	$32,445,849	$32,445,849	$32,445,849	$32,445,849
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$53,816,628	$53,816,628	$53,816,628	$53,816,628
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$594,384,517	N/A	N/A
Subtotal	N/A	N/A	$594,384,517	N/A	N/A
Participant Costs					
Incremental Capital Costs	$135,090,684	N/A	N/A	$135,090,684	$135,065,056
Incremental O&M Costs	$6,449,327	N/A	N/A	$6,449,327	$7,847,282
Subtotal	$141,540,011	N/A	N/A	$141,540,011	$142,912,339
Total Costs	$141,540,011	$53,816,628	$648,201,145	$195,356,639	$196,728,967
Net Benefit (Cost)	**$579,179,875**	**$146,119,715**	**($448,264,802)**	**$130,915,073**	**$219,111,172**
Benefit/Cost Ratio	**5.09**	**3.72**	**0.31**	**1.67**	**2.11**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.5 years
T & D Loss Factor (Energy)	6.66%
T & D Loss Factor (Demand)	8.07%
Net coincident kW Saved at Generator	3.33 kW
Gross Annual kWh Saved at Customer	11,981 kWh
Net Annual kWh Saved at Generator	12,832 kWh

Program Summary All Participants	
Total Participants	**32,607**
Total Budget	**$53,816,628**
Net coincident kW Saved at Generator	**108,712 kW**
Gross Annual kWh Saved at Customer	390,658,369 kWh
Net Annual kWh Saved at Generator	**418,426,313 kWh**

Utility Program Cost per kWh Lifetime	**$0.0078**
Utility Program Cost per kW at Gen	**$495**

BUSINESS SEGMENT EE AND DR TOTAL

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$60,764,994	$60,764,994	$60,764,994	$71,436,589
T & D	N/A	$9,429,358	$9,429,358	$9,429,358	$11,284,244
Marginal Energy	N/A	$137,918,734	$137,918,734	$137,918,734	$170,637,706
Environmental Externality	N/A	N/A	N/A	N/A	$28,643,820
Subtotal	N/A	$208,113,086	$208,113,086	$208,113,086	$282,002,359
Participant Benefits					
Bill Reduction - Electric	$605,328,311	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$32,731,172	N/A	N/A	$32,731,172	$32,731,172
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$93,831,454	N/A	N/A	$93,912,500	$115,311,062
Subtotal	$731,890,937	N/A	N/A	$126,643,672	$148,042,235
Total Benefits	$731,890,937	$208,113,086	$208,113,086	$334,756,758	$430,044,594
Costs					
Utility Project Costs					
Customer Services	N/A	$3,552,904	$3,552,904	$3,552,904	$3,552,904
Project Administration	N/A	$17,023,164	$17,023,164	$17,023,164	$17,023,164
Advertising & Promotion	N/A	$774,700	$774,700	$774,700	$774,700
Measurement & Verification	N/A	$1,017,100	$1,017,100	$1,017,100	$1,017,100
Rebates	N/A	$32,731,172	$32,731,172	$32,731,172	$32,731,172
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$55,099,040	$55,099,040	$55,099,040	$55,099,040
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$605,328,311	N/A	N/A
Subtotal	N/A	N/A	$605,328,311	N/A	N/A
Participant Costs					
Incremental Capital Costs	$134,225,188	N/A	N/A	$134,225,188	$134,178,418
Incremental O&M Costs	$6,112,480	N/A	N/A	$6,112,480	$7,434,581
Subtotal	$140,337,668	N/A	N/A	$140,337,668	$141,612,999
Total Costs	$140,337,668	$55,099,040	$660,427,352	$195,436,709	$196,712,039
Net Benefit (Cost)	**$591,553,269**	**$153,014,046**	**($452,314,266)**	**$139,320,049**	**$233,332,554**
Benefit/Cost Ratio	**5.22**	**3.78**	**0.32**	**1.71**	**2.19**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.4 years
T & D Loss Factor (Energy)	6.66%
T & D Loss Factor (Demand)	8.07%
Net coincident kW Saved at Generator	3.81 kW
Gross Annual kWh Saved at Customer	11,823 kWh
Net Annual kWh Saved at Generator	12,664 kWh

Program Summary All Participants	
Total Participants	**32,957**
Total Budget	**$55,099,040**
Net coincident kW Saved at Generator	**125,562 kW**
Gross Annual kWh Saved at Customer	389,666,149 kWh
Net Annual kWh Saved at Generator	**417,362,227 kWh**

Utility Program Cost per kWh Lifetime	**$0.0081**
Utility Program Cost per kW at Gen	**$439**

BUSINESS SEGMENT EE AND DR TOTAL

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$62,956,964	$62,956,964	$62,956,964	$73,681,078
T & D	N/A	$9,584,775	$9,584,775	$9,584,775	$11,450,747
Marginal Energy	N/A	$146,535,924	$146,535,924	$146,535,924	$180,852,940
Environmental Externality	N/A	N/A	N/A	N/A	$23,732,872
Subtotal	N/A	$219,077,663	$219,077,663	$219,077,663	$289,717,638
Participant Benefits					
Bill Reduction - Electric	$620,449,101	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$33,441,476	N/A	N/A	$33,441,476	$33,441,476
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$93,986,870	N/A	N/A	$93,986,870	$115,395,952
Subtotal	$747,877,447	N/A	N/A	$127,428,346	$148,837,428
Total Benefits	$747,877,447	$219,077,663	$219,077,663	$346,506,009	$438,555,066
Costs					
Utility Project Costs					
Customer Services	N/A	$3,757,936	$3,757,936	$3,757,936	$3,757,936
Project Administration	N/A	$17,460,443	$17,460,443	$17,460,443	$17,460,443
Advertising & Promotion	N/A	$788,662	$788,662	$788,662	$788,662
Measurement & Verification	N/A	$1,024,330	$1,024,330	$1,024,330	$1,024,330
Rebates	N/A	$33,441,476	$33,441,476	$33,441,476	$33,441,476
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$56,472,847	$56,472,847	$56,472,847	$56,472,847
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$620,449,101	N/A	N/A
Subtotal	N/A	N/A	$620,449,101	N/A	N/A
Participant Costs					
Incremental Capital Costs	$136,450,426	N/A	N/A	$136,450,426	$136,398,048
Incremental O&M Costs	$5,979,425	N/A	N/A	$5,979,425	$7,264,874
Subtotal	$142,429,851	N/A	N/A	$142,429,851	$143,662,922
Total Costs	$142,429,851	$56,472,847	$676,921,948	$198,902,698	$200,135,769
Net Benefit (Cost)	**$605,447,596**	**$162,604,816**	**($457,844,285)**	**$147,603,311**	**$238,419,297**
Benefit/Cost Ratio	**5.25**	**3.88**	**0.32**	**1.74**	**2.19**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.2 years
T & D Loss Factor (Energy)	6.66%
T & D Loss Factor (Demand)	8.07%
Net coincident kW Saved at Generator	4.14 kW
Gross Annual kWh Saved at Customer	11,362 kWh
Net Annual kWh Saved at Generator	12,170 kWh

Program Summary All Participants	
Total Participants	**34,457**
Total Budget	**$56,472,847**
Net coincident kW Saved at Generator	**142,680 kW**
Gross Annual kWh Saved at Customer	391,501,964 kWh
Net Annual kWh Saved at Generator	**419,326,539 kWh**

Utility Program Cost per kWh Lifetime	**$0.0083**
Utility Program Cost per kW at Gen	**$396**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **Business Segment EE and DR Total**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$2,263,396	$2,338,118	$2,503,501
Incentive Costs =	$2,731,030	$2,926,338	$2,959,486
16) Total Utility Project Costs =	$4,994,426	$5,264,455	$5,462,987
17) Direct Participant Costs ($/Part.) =	$4,305	$4,408	$4,220
18) Participant Non-Energy Costs (Annual $/Part.) =	$6	$6	$5
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$1,589	$1,692	$1,620
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	14.3	13.9	13.9
21) Avg. Dth/Part. Saved =	137.37	138.99	132.90
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	3,906	4,166	4,375
24) Total Annual Dth Saved =	536,578	579,017	581,420
25) Incentive/Participant =	$699.19	$702.43	$676.45

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$1,279	$1,264	$1,249
Cost per Participant per Dth =	$41	$40.85	$41.19
Lifetime Energy Reduction (Dth)	23,856,403		
Societal Cost per Dth	$2.92		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($48,792,220)	0.68
Utility Cost Test	$87,216,991	6.55
Societal Test	$134,031,505	2.93
Participant Test	$104,921,523	2.95

BUSINESS ENERGY ASSESSMENTS

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$365,859	$365,859	$365,859	$424,669
T & D	N/A	$65,109	$65,109	$65,109	$75,705
Marginal Energy	N/A	$1,306,724	$1,306,724	$1,306,724	$1,535,466
Environmental Externality	N/A	N/A	N/A	N/A	$255,621
Subtotal	N/A	$1,737,692	$1,737,692	$1,737,692	$2,291,461
Participant Benefits					
Bill Reduction - Electric	$5,800,079	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$477,582	N/A	N/A	$477,582	$477,582
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$82,246	N/A	N/A	$82,246	$95,203
Subtotal	$6,359,907	N/A	N/A	$559,829	$572,785
Total Benefits	$6,359,907	$1,737,692	$1,737,692	$2,297,521	$2,864,246
Costs					
Utility Project Costs					
Customer Services	N/A	$352,000	$352,000	$352,000	$352,000
Project Administration	N/A	$522,038	$522,038	$522,038	$522,038
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$20,000	$20,000	$20,000	$20,000
Rebates	N/A	$477,582	$477,582	$477,582	$477,582
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,371,620	$1,371,620	$1,371,620	$1,371,620
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$5,800,079	N/A	N/A
Subtotal	N/A	N/A	$5,800,079	N/A	N/A
Participant Costs					
Incremental Capital Costs	$1,220,080	N/A	N/A	$1,220,080	$1,220,080
Incremental O&M Costs	$55,170	N/A	N/A	$55,170	$65,727
Subtotal	$1,275,249	N/A	N/A	$1,275,249	$1,285,807
Total Costs	$1,275,249	$1,371,620	$7,171,699	$2,646,870	$2,657,427
Net Benefit (Cost)	**$5,084,658**	**$366,072**	**($5,434,007)**	**($349,348)**	**$206,819**
Benefit/Cost Ratio	**4.99**	**1.27**	**0.24**	**0.87**	**1.08**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	11.6 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	4.29 kW
Gross Annual kWh Saved at Customer	45,078 kWh
Net Annual kWh Saved at Generator	48,289 kWh

Program Summary All Participants	
Total Participants	**126**
Total Budget	**$1,371,620**
Net coincident kW Saved at Generator	**540 kW**
Gross Annual kWh Saved at Customer	5,679,835 kWh
Net Annual kWh Saved at Generator	**6,084,451 kWh**

Utility Program Cost per kWh Lifetime	**$0.0195**
Utility Program Cost per kW at Gen	**$2,539**

BUSINESS ENERGY ASSESSMENTS

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$920,640	$920,640	$920,640	$1,068,841
T & D	N/A	$164,195	$164,195	$164,195	$190,963
Marginal Energy	N/A	$3,530,049	$3,530,049	$3,530,049	$4,153,986
Environmental Externality	N/A	N/A	N/A	N/A	$792,260
Subtotal	N/A	$4,614,884	$4,614,884	$4,614,884	$6,206,051
Participant Benefits					
Bill Reduction - Electric	$15,151,201	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$967,448	N/A	N/A	$967,448	$967,448
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$82,246	N/A	N/A	$163,292	$187,344
Subtotal	$16,200,895	N/A	N/A	$1,130,740	$1,154,791
Total Benefits	$16,200,895	$4,614,884	$4,614,884	$5,745,624	$7,360,842
Costs					
Utility Project Costs					
Customer Services	N/A	$412,000	$412,000	$412,000	$412,000
Project Administration	N/A	$528,758	$528,758	$528,758	$528,758
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$20,000	$20,000	$20,000	$20,000
Rebates	N/A	$967,448	$967,448	$967,448	$967,448
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,928,206	$1,928,206	$1,928,206	$1,928,206
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$15,151,201	N/A	N/A
Subtotal	N/A	N/A	$15,151,201	N/A	N/A
Participant Costs					
Incremental Capital Costs	$3,198,375	N/A	N/A	$3,198,375	$3,198,310
Incremental O&M Costs	$110,339	N/A	N/A	$110,339	$131,454
Subtotal	$3,308,714	N/A	N/A	$3,308,714	$3,329,764
Total Costs	$3,308,714	$1,928,206	$17,079,407	$5,236,919	$5,257,970
Net Benefit (Cost)	**$12,892,181**	**$2,686,678**	**($12,464,523)**	**$508,704**	**$2,102,872**
Benefit/Cost Ratio	**4.90**	**2.39**	**0.27**	**1.10**	**1.40**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	12.1 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	5.44 kW
Gross Annual kWh Saved at Customer	57,255 kWh
Net Annual kWh Saved at Generator	61,334 kWh

Program Summary All Participants	
Total Participants	**241**
Total Budget	**$1,928,206**
Net coincident kW Saved at Generator	**1,310 kW**
Gross Annual kWh Saved at Customer	13,798,500 kWh
Net Annual kWh Saved at Generator	**14,781,467 kWh**

Utility Program Cost per kWh Lifetime	**$0.0108**
Utility Program Cost per kW at Gen	**$1,472**

BUSINESS ENERGY ASSESSMENTS

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$1,254,075	$1,254,075	$1,254,075	$1,453,928
T & D	N/A	$222,070	$222,070	$222,070	$258,247
Marginal Energy	N/A	$5,096,815	$5,096,815	$5,096,815	$5,989,808
Environmental Externality	N/A	N/A	N/A	N/A	$825,263
Subtotal	N/A	$6,572,960	$6,572,960	$6,572,960	$8,527,246
Participant Benefits					
Bill Reduction - Electric	$21,015,133	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$1,351,794	N/A	N/A	$1,351,794	$1,351,794
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$231,803	N/A	N/A	$231,803	$265,782
Subtotal	$22,598,729	N/A	N/A	$1,583,597	$1,617,576
Total Benefits	$22,598,729	$6,572,960	$6,572,960	$8,156,557	$10,144,823
Costs					
Utility Project Costs					
Customer Services	N/A	$472,000	$472,000	$472,000	$472,000
Project Administration	N/A	$535,679	$535,679	$535,679	$535,679
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$20,000	$20,000	$20,000	$20,000
Rebates	N/A	$1,351,794	$1,351,794	$1,351,794	$1,351,794
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$2,379,473	$2,379,473	$2,379,473	$2,379,473
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$21,015,133	N/A	N/A
Subtotal	N/A	N/A	$21,015,133	N/A	N/A
Participant Costs					
Incremental Capital Costs	$4,474,885	N/A	N/A	$4,474,885	$4,474,858
Incremental O&M Costs	$110,339	N/A	N/A	$110,339	$131,454
Subtotal	$4,585,224	N/A	N/A	$4,585,224	$4,606,312
Total Costs	$4,585,224	$2,379,473	$23,394,606	$6,964,697	$6,985,786
Net Benefit (Cost)	**$18,013,506**	**$4,193,487**	**($16,821,646)**	**$1,191,860**	**$3,159,037**
Benefit/Cost Ratio	**4.93**	**2.76**	**0.28**	**1.17**	**1.45**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	12.2 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	5.92 kW
Gross Annual kWh Saved at Customer	56,976 kWh
Net Annual kWh Saved at Generator	61,034 kWh

Program Summary All Participants	
Total Participants	**323**
Total Budget	**$2,379,473**
Net coincident kW Saved at Generator	**1,912 kW**
Gross Annual kWh Saved at Customer	18,403,100 kWh
Net Annual kWh Saved at Generator	**19,714,087 kWh**

Utility Program Cost per kWh Lifetime	**$0.0099**
Utility Program Cost per kW at Gen	**$1,245**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **BUSINESS ENERGY ASSESSMENTS**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$187,502	$192,202	$196,922
Incentive Costs =	$17,112	$51,014	$90,605
16) Total Utility Project Costs =	$204,614	$243,216	$287,527
17) Direct Participant Costs ($/Part.) =	$11,766	$20,608	$11,039
18) Participant Non-Energy Costs (Annual $/Part.) =	$1	$1	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$27,370	$44,672	$23,932
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	18.0	17.8	17.8
21) Avg. Dth/Part. Saved =	467.30	711.16	380.98
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	8	15	28
24) Total Annual Dth Saved =	3,738	10,667	10,667
25) Incentive/Participant =	$2,139.06	$3,400.91	$3,235.88

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$25,577	$16,214	$10,269
Cost per Participant per Dth =	$80	$51.78	$55.93
Lifetime Energy Reduction (Dth)	446,359		
Societal Cost per Dth	$3.24		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($1,354,886)	0.59
Utility Cost Test	$1,200,090	2.63
Societal Test	$4,084,403	3.82
Participant Test	$3,390,220	5.76

BUSINESS NEW CONSTRUCTION

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$11,798,602	$11,798,602	$11,798,602	$14,348,581
T & D	N/A	$2,112,476	$2,112,476	$2,112,476	$2,575,948
Marginal Energy	N/A	$21,541,059	$21,541,059	$21,541,059	$27,366,132
Environmental Externality	N/A	N/A	N/A	N/A	$3,893,850
Subtotal	N/A	$35,452,136	$35,452,136	$35,452,136	$48,184,511
Participant Benefits					
Bill Reduction - Electric	$96,441,607	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$7,531,921	N/A	N/A	$7,531,921	$7,531,921
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$103,973,528	N/A	N/A	$7,531,921	$7,531,921
Total Benefits	$103,973,528	$35,452,136	$35,452,136	$42,984,057	$55,716,432
Costs					
Utility Project Costs					
Customer Services	N/A	$1,453,025	$1,453,025	$1,453,025	$1,453,025
Project Administration	N/A	$1,349,023	$1,349,023	$1,349,023	$1,349,023
Advertising & Promotion	N/A	$18,950	$18,950	$18,950	$18,950
Measurement & Verification	N/A	$625,000	$625,000	$625,000	$625,000
Rebates	N/A	$7,531,921	$7,531,921	$7,531,921	$7,531,921
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$10,977,919	$10,977,919	$10,977,919	$10,977,919
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$96,441,607	N/A	N/A
Subtotal	N/A	N/A	$96,441,607	N/A	N/A
Participant Costs					
Incremental Capital Costs	$27,088,888	N/A	N/A	$27,088,888	$27,075,845
Incremental O&M Costs	$340,926	N/A	N/A	$340,926	$424,247
Subtotal	$27,429,814	N/A	N/A	$27,429,814	$27,500,091
Total Costs	$27,429,814	$10,977,919	$107,419,526	$38,407,733	$38,478,010
Net Benefit (Cost)	**$76,543,714**	**$24,474,218**	**($71,967,390)**	**$4,576,324**	**$17,238,422**
Benefit/Cost Ratio	**3.79**	**3.23**	**0.33**	**1.12**	**1.45**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	19.7 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	52.91 kW
Gross Annual kWh Saved at Customer	211,038 kWh
Net Annual kWh Saved at Generator	226,072 kWh

Program Summary All Participants	
Total Participants	**250**
Total Budget	**$10,977,919**
Net coincident kW Saved at Generator	**13,227 kW**
Gross Annual kWh Saved at Customer	52,759,461 kWh
Net Annual kWh Saved at Generator	**56,517,902 kWh**

Utility Program Cost per kWh Lifetime	**$0.0099**
Utility Program Cost per kW at Gen	**$830**

BUSINESS NEW CONSTRUCTION

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$11,885,977	$11,885,977	$11,885,977	$14,390,550
T & D	N/A	$2,128,336	$2,128,336	$2,128,336	$2,584,713
Marginal Energy	N/A	$21,764,533	$21,764,533	$21,764,533	$27,611,812
Environmental Externality	N/A	N/A	N/A	N/A	$4,336,009
Subtotal	N/A	$35,778,846	$35,778,846	$35,778,846	$48,923,083
Participant Benefits					
Bill Reduction - Electric	$94,746,702	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$7,009,565	N/A	N/A	$7,009,565	$7,009,565
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$101,756,267	N/A	N/A	$7,009,565	$7,009,565
Total Benefits	$101,756,267	$35,778,846	$35,778,846	$42,788,411	$55,932,648
Costs					
Utility Project Costs					
Customer Services	N/A	$1,582,759	$1,582,759	$1,582,759	$1,582,759
Project Administration	N/A	$1,367,121	$1,367,121	$1,367,121	$1,367,121
Advertising & Promotion	N/A	$18,950	$18,950	$18,950	$18,950
Measurement & Verification	N/A	$625,000	$625,000	$625,000	$625,000
Rebates	N/A	$7,009,565	$7,009,565	$7,009,565	$7,009,565
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$10,603,395	$10,603,395	$10,603,395	$10,603,395
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$94,746,702	N/A	N/A
Subtotal	N/A	N/A	$94,746,702	N/A	N/A
Participant Costs					
Incremental Capital Costs	$26,073,841	N/A	N/A	$26,073,841	$26,038,546
Incremental O&M Costs	$324,751	N/A	N/A	$324,751	$403,949
Subtotal	$26,398,591	N/A	N/A	$26,398,591	$26,442,495
Total Costs	$26,398,591	$10,603,395	$105,350,097	$37,001,986	$37,045,890
Net Benefit (Cost)	**$75,357,676**	**$25,175,451**	**($69,571,251)**	**$5,786,425**	**$18,886,758**
Benefit/Cost Ratio	**3.85**	**3.37**	**0.34**	**1.16**	**1.51**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	19.4 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.08%
Net coincident kW Saved at Generator	47.17 kW
Gross Annual kWh Saved at Customer	177,650 kWh
Net Annual kWh Saved at Generator	190,306 kWh

Program Summary All Participants	
Total Participants	**287**
Total Budget	**$10,603,395**
Net coincident kW Saved at Generator	**13,537 kW**
Gross Annual kWh Saved at Customer	50,985,690 kWh
Net Annual kWh Saved at Generator	**54,617,918 kWh**

Utility Program Cost per kWh Lifetime	**$0.0100**
Utility Program Cost per kW at Gen	**$783**

BUSINESS NEW CONSTRUCTION

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$11,738,274	$11,738,274	$11,738,274	$14,148,276
T & D	N/A	$2,108,739	$2,108,739	$2,108,739	$2,549,269
Marginal Energy	N/A	$21,531,605	$21,531,605	$21,531,605	$27,231,934
Environmental Externality	N/A	N/A	N/A	N/A	$3,445,283
Subtotal	N/A	$35,378,619	$35,378,619	$35,378,619	$47,374,761
Participant Benefits					
Bill Reduction - Electric	$90,513,389	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$6,649,865	N/A	N/A	$6,649,865	$6,649,865
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$97,163,254	N/A	N/A	$6,649,865	$6,649,865
Total Benefits	$97,163,254	$35,378,619	$35,378,619	$42,028,484	$54,024,626
Costs					
Utility Project Costs					
Customer Services	N/A	$1,720,551	$1,720,551	$1,720,551	$1,720,551
Project Administration	N/A	$1,382,555	$1,382,555	$1,382,555	$1,382,555
Advertising & Promotion	N/A	$18,950	$18,950	$18,950	$18,950
Measurement & Verification	N/A	$625,000	$625,000	$625,000	$625,000
Rebates	N/A	$6,649,865	$6,649,865	$6,649,865	$6,649,865
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$10,396,921	$10,396,921	$10,396,921	$10,396,921
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$90,513,389	N/A	N/A
Subtotal	N/A	N/A	$90,513,389	N/A	N/A
Participant Costs					
Incremental Capital Costs	$27,246,376	N/A	N/A	$27,246,376	$27,207,993
Incremental O&M Costs	$326,210	N/A	N/A	$326,210	$406,173
Subtotal	$27,572,586	N/A	N/A	$27,572,586	$27,614,166
Total Costs	$27,572,586	$10,396,921	$100,910,310	$37,969,507	$38,011,087
Net Benefit (Cost)	**$69,590,668**	**$24,981,698**	**($65,531,691)**	**$4,058,977**	**$16,013,539**
Benefit/Cost Ratio	**3.52**	**3.40**	**0.35**	**1.11**	**1.42**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	19.1 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.07%
Net coincident kW Saved at Generator	40.47 kW
Gross Annual kWh Saved at Customer	143,797 kWh
Net Annual kWh Saved at Generator	154,040 kWh

Program Summary All Participants	
Total Participants	**334**
Total Budget	**$10,396,921**
Net coincident kW Saved at Generator	**13,516 kW**
Gross Annual kWh Saved at Customer	48,028,060 kWh
Net Annual kWh Saved at Generator	**51,449,521 kWh**

Utility Program Cost per kWh Lifetime	**$0.0106**
Utility Program Cost per kW at Gen	**$769**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **BUSINESS NEW CONSTRUCTION**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$427,526	$443,531	$460,740
Incentive Costs =	$475,756	$482,896	$432,139
16) Total Utility Project Costs =	$903,282	$926,427	$892,879
17) Direct Participant Costs ($/Part.) =	$76,652	$51,497	$37,873
18) Participant Non-Energy Costs (Annual $/Part.) =	$88	$64	$47
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	19.9	19.7	19.7
21) Avg. Dth/Part. Saved =	983.11	668.36	494.66
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	87	131	177
24) Total Annual Dth Saved =	85,531	87,555	87,555
25) Incentive/Participant =	$5,468.46	$3,686.23	$2,441.46

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$10,383	$7,072	$5,045
Cost per Participant per Dth =	$89	$87.73	$86.86
Lifetime Energy Reduction (Dth)	5,148,463		
Societal Cost per Dth	$4.46		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($9,747,805)	0.69
Utility Cost Test	$19,215,616	8.06
Societal Test	$16,053,706	1.70
Participant Test	$8,529,439	1.42

COMMERCIAL EFFICIENCY

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$4,841,415	$4,841,415	$4,841,415	$5,766,499
T & D	N/A	$809,995	$809,995	$809,995	$975,187
Marginal Energy	N/A	$15,241,118	$15,241,118	$15,241,118	$18,886,693
Environmental Externality	N/A	N/A	N/A	N/A	$2,824,331
Subtotal	N/A	$20,892,527	$20,892,527	$20,892,527	$28,452,711
Participant Benefits					
Bill Reduction - Electric	$68,150,312	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$3,347,068	N/A	N/A	$3,347,068	$3,347,068
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$1,032,143	N/A	N/A	$1,032,143	$1,260,979
Subtotal	$72,529,523	N/A	N/A	$4,379,211	$4,608,047
Total Benefits	$72,529,523	$20,892,527	$20,892,527	$25,271,738	$33,060,758
Costs					
Utility Project Costs					
Customer Services	N/A	$354,950	$354,950	$354,950	$354,950
Project Administration	N/A	$702,164	$702,164	$702,164	$702,164
Advertising & Promotion	N/A	$25,000	$25,000	$25,000	$25,000
Measurement & Verification	N/A	$15,000	$15,000	$15,000	$15,000
Rebates	N/A	$3,347,068	$3,347,068	$3,347,068	$3,347,068
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$4,444,182	$4,444,182	$4,444,182	$4,444,182
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$68,150,312	N/A	N/A
Subtotal	N/A	N/A	$68,150,312	N/A	N/A
Participant Costs					
Incremental Capital Costs	$13,737,192	N/A	N/A	$13,737,192	$13,734,493
Incremental O&M Costs	$505,760	N/A	N/A	$505,760	$634,626
Subtotal	$14,242,952	N/A	N/A	$14,242,952	$14,369,120
Total Costs	$14,242,952	$4,444,182	$72,594,494	$18,687,134	$18,813,301
Net Benefit (Cost)	**$58,286,571**	**$16,448,345**	**($51,701,967)**	**$6,584,604**	**$14,247,457**
Benefit/Cost Ratio	**5.09**	**4.70**	**0.29**	**1.35**	**1.76**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.6 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	12.76 kW
Gross Annual kWh Saved at Customer	84,325 kWh
Net Annual kWh Saved at Generator	90,332 kWh

Program Summary All Participants	
Total Participants	**533**
Total Budget	**$4,444,182**
Net coincident kW Saved at Generator	**6,800 kW**
Gross Annual kWh Saved at Customer	44,945,273 kWh
Net Annual kWh Saved at Generator	**48,147,052 kWh**

Utility Program Cost per kWh Lifetime	**$0.0055**
Utility Program Cost per kW at Gen	**$654**

COMMERCIAL EFFICIENCY

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$4,965,831	$4,965,831	$4,965,831	$5,909,420
T & D	N/A	$829,151	$829,151	$829,151	$998,259
Marginal Energy	N/A	$16,175,464	$16,175,464	$16,175,464	$20,056,740
Environmental Externality	N/A	N/A	N/A	N/A	$3,352,287
Subtotal	N/A	$21,970,446	$21,970,446	$21,970,446	$30,316,706
Participant Benefits					
Bill Reduction - Electric	$70,297,227	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$3,360,818	N/A	N/A	$3,360,818	$3,360,818
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$1,032,143	N/A	N/A	$1,032,143	$1,260,979
Subtotal	$74,690,188	N/A	N/A	$4,392,961	$4,621,798
Total Benefits	$74,690,188	$21,970,446	$21,970,446	$26,363,408	$34,938,504
Costs					
Utility Project Costs					
Customer Services	N/A	$354,950	$354,950	$354,950	$354,950
Project Administration	N/A	$716,677	$716,677	$716,677	$716,677
Advertising & Promotion	N/A	$25,000	$25,000	$25,000	$25,000
Measurement & Verification	N/A	$15,000	$15,000	$15,000	$15,000
Rebates	N/A	$3,360,818	$3,360,818	$3,360,818	$3,360,818
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$4,472,445	$4,472,445	$4,472,445	$4,472,445
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$70,297,227	N/A	N/A
Subtotal	N/A	N/A	$70,297,227	N/A	N/A
Participant Costs					
Incremental Capital Costs	$13,737,618	N/A	N/A	$13,737,618	$13,735,517
Incremental O&M Costs	$505,760	N/A	N/A	$505,760	$634,626
Subtotal	$14,243,378	N/A	N/A	$14,243,378	$14,370,143
Total Costs	$14,243,378	$4,472,445	$74,769,672	$18,715,823	$18,842,589
Net Benefit (Cost)	**$60,446,810**	**$17,498,001**	**($52,799,225)**	**$7,647,585**	**$16,095,915**
Benefit/Cost Ratio	**5.24**	**4.91**	**0.29**	**1.41**	**1.85**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.6 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	13.54 kW
Gross Annual kWh Saved at Customer	84,014 kWh
Net Annual kWh Saved at Generator	89,999 kWh

Program Summary All Participants	
Total Participants	**535**
Total Budget	**$4,472,445**
Net coincident kW Saved at Generator	**7,245 kW**
Gross Annual kWh Saved at Customer	44,947,725 kWh
Net Annual kWh Saved at Generator	**48,149,679 kWh**

Utility Program Cost per kWh Lifetime	**$0.0056**
Utility Program Cost per kW at Gen	**$617**

COMMERCIAL EFFICIENCY

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$5,019,298	$5,019,298	$5,019,298	$5,963,565
T & D	N/A	$835,363	$835,363	$835,363	$1,005,135
Marginal Energy	N/A	$17,146,928	$17,146,928	$17,146,928	$21,238,166
Environmental Externality	N/A	N/A	N/A	N/A	$2,779,010
Subtotal	N/A	$23,001,588	$23,001,588	$23,001,588	$30,985,876
Participant Benefits					
Bill Reduction - Electric	$71,902,744	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$3,355,595	N/A	N/A	$3,355,595	$3,355,595
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$1,032,143	N/A	N/A	$1,032,143	$1,260,979
Subtotal	$76,290,482	N/A	N/A	$4,387,738	$4,616,575
Total Benefits	$76,290,482	$23,001,588	$23,001,588	$27,389,326	$35,602,451
Costs					
Utility Project Costs					
Customer Services	N/A	$354,950	$354,950	$354,950	$354,950
Project Administration	N/A	$731,595	$731,595	$731,595	$731,595
Advertising & Promotion	N/A	$25,000	$25,000	$25,000	$25,000
Measurement & Verification	N/A	$15,000	$15,000	$15,000	$15,000
Rebates	N/A	$3,355,595	$3,355,595	$3,355,595	$3,355,595
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$4,482,140	$4,482,140	$4,482,140	$4,482,140
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$71,902,744	N/A	N/A
Subtotal	N/A	N/A	$71,902,744	N/A	N/A
Participant Costs					
Incremental Capital Costs	$13,738,129	N/A	N/A	$13,738,129	$13,734,721
Incremental O&M Costs	$504,380	N/A	N/A	$504,380	$632,474
Subtotal	$14,242,509	N/A	N/A	$14,242,509	$14,367,196
Total Costs	$14,242,509	$4,482,140	$76,384,884	$18,724,649	$18,849,336
Net Benefit (Cost)	**$62,047,973**	**$18,519,448**	**($53,383,296)**	**$8,664,677**	**$16,753,115**
Benefit/Cost Ratio	**5.36**	**5.13**	**0.30**	**1.46**	**1.89**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.6 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	14.19 kW
Gross Annual kWh Saved at Customer	83,128 kWh
Net Annual kWh Saved at Generator	89,050 kWh

Program Summary All Participants	
Total Participants	**537**
Total Budget	**$4,482,140**
Net coincident kW Saved at Generator	**7,617 kW**
Gross Annual kWh Saved at Customer	44,639,884 kWh
Net Annual kWh Saved at Generator	**47,819,907 kWh**

Utility Program Cost per kWh Lifetime	**$0.0056**
Utility Program Cost per kW at Gen	**$588**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **COMMERCIAL EFFICIENCY**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$186,599	$188,302	$190,056
Incentive Costs =	$154,190	$153,936	$150,698
16) Total Utility Project Costs =	$340,789	$342,238	$340,754
17) Direct Participant Costs ($/Part.) =	$15,428	$15,426	$15,423
18) Participant Non-Energy Costs (Annual $/Part.) =	$33	$37	$37
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$1,941	$1,941	$1,941
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	18.5	18.5	18.5
21) Avg. Dth/Part. Saved =	607.74	607.74	607.74
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	71	71	71
24) Total Annual Dth Saved =	43,150	43,150	43,150
25) Incentive/Participant =	$2,171.69	$2,168.12	$2,122.50

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$4,800	$4,820	$4,799
Cost per Participant per Dth =	$33	$33.37	$33.33
Lifetime Energy Reduction (Dth)	2,390,928		
Societal Cost per Dth	$1.81		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($4,293,015)	0.70
Utility Cost Test	$9,189,504	9.98
Societal Test	$14,048,712	4.25
Participant Test	$10,315,478	4.13

COMMERCIAL STREAMLINED ASSESSMENT

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$2,396,921	$2,396,921	$2,396,921	$2,906,532
T & D	N/A	$429,011	$429,011	$429,011	$521,620
Marginal Energy	N/A	$5,475,095	$5,475,095	$5,475,095	$6,934,669
Environmental Externality	N/A	N/A	N/A	N/A	$992,348
Subtotal	N/A	$8,301,027	$8,301,027	$8,301,027	$11,355,168
Participant Benefits					
Bill Reduction - Electric	$24,582,821	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$1,355,832	N/A	N/A	$1,355,832	$1,355,832
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$5,864	N/A	N/A	$5,864	$6,695
Subtotal	$25,944,516	N/A	N/A	$1,361,695	$1,362,527
Total Benefits	$25,944,516	$8,301,027	$8,301,027	$9,662,722	$12,717,695
Costs					
Utility Project Costs					
Customer Services	N/A	$350,000	$350,000	$350,000	$350,000
Project Administration	N/A	$219,942	$219,942	$219,942	$219,942
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$1,200	$1,200	$1,200	$1,200
Rebates	N/A	$1,355,832	$1,355,832	$1,355,832	$1,355,832
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,926,974	$1,926,974	$1,926,974	$1,926,974
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$24,582,821	N/A	N/A
Subtotal	N/A	N/A	$24,582,821	N/A	N/A
Participant Costs					
Incremental Capital Costs	$4,406,471	N/A	N/A	$4,406,471	$4,406,471
Incremental O&M Costs	$804,994	N/A	N/A	$804,994	$1,010,105
Subtotal	$5,211,465	N/A	N/A	$5,211,465	$5,416,576
Total Costs	$5,211,465	$1,926,974	$26,509,795	$7,138,439	$7,343,550
Net Benefit (Cost)	**$20,733,051**	**$6,374,053**	**($18,208,768)**	**$2,524,283**	**$5,374,145**
Benefit/Cost Ratio	**4.98**	**4.31**	**0.31**	**1.35**	**1.73**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	19.3 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	8.55 kW
Gross Annual kWh Saved at Customer	43,022 kWh
Net Annual kWh Saved at Generator	46,087 kWh

Program Summary All Participants	
Total Participants	**320**
Total Budget	**$1,926,974**
Net coincident kW Saved at Generator	**2,737 kW**
Gross Annual kWh Saved at Customer	13,767,005 kWh
Net Annual kWh Saved at Generator	**14,747,729 kWh**

Utility Program Cost per kWh Lifetime	**$0.0068**
Utility Program Cost per kW at Gen	**$704**

COMMERCIAL STREAMLINED ASSESSMENT

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$2,230,738	$2,230,738	$2,230,738	$2,704,697
T & D	N/A	$400,547	$400,547	$400,547	$486,969
Marginal Energy	N/A	$5,249,411	$5,249,411	$5,249,411	$6,655,644
Environmental Externality	N/A	N/A	N/A	N/A	$1,049,948
Subtotal	N/A	$7,880,696	$7,880,696	$7,880,696	$10,897,257
Participant Benefits					
Bill Reduction - Electric	$22,929,502	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$1,263,591	N/A	N/A	$1,263,591	$1,263,591
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$4,886	N/A	N/A	$4,886	$5,579
Subtotal	$24,197,979	N/A	N/A	$1,268,477	$1,269,170
Total Benefits	$24,197,979	$7,880,696	$7,880,696	$9,149,174	$12,166,427
Costs					
Utility Project Costs					
Customer Services	N/A	$350,000	$350,000	$350,000	$350,000
Project Administration	N/A	$221,703	$221,703	$221,703	$221,703
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$1,200	$1,200	$1,200	$1,200
Rebates	N/A	$1,263,591	$1,263,591	$1,263,591	$1,263,591
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,836,494	$1,836,494	$1,836,494	$1,836,494
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$22,929,502	N/A	N/A
Subtotal	N/A	N/A	$22,929,502	N/A	N/A
Participant Costs					
Incremental Capital Costs	$4,015,205	N/A	N/A	$4,015,205	$4,015,205
Incremental O&M Costs	$721,719	N/A	N/A	$721,719	$905,612
Subtotal	$4,736,924	N/A	N/A	$4,736,924	$4,920,816
Total Costs	$4,736,924	$1,836,494	$24,765,996	$6,573,418	$6,757,310
Net Benefit (Cost)	**$19,461,056**	**$6,044,202**	**($16,885,300)**	**$2,575,756**	**$5,409,117**
Benefit/Cost Ratio	**5.11**	**4.29**	**0.32**	**1.39**	**1.80**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	19.3 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	8.01 kW
Gross Annual kWh Saved at Customer	39,841 kWh
Net Annual kWh Saved at Generator	42,679 kWh

Program Summary All Participants	
Total Participants	**312**
Total Budget	**$1,836,494**
Net coincident kW Saved at Generator	**2,498 kW**
Gross Annual kWh Saved at Customer	12,430,449 kWh
Net Annual kWh Saved at Generator	**13,315,960 kWh**

Utility Program Cost per kWh Lifetime	**$0.0072**
Utility Program Cost per kW at Gen	**$735**

COMMERCIAL STREAMLINED ASSESSMENT

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$2,128,607	$2,128,607	$2,128,607	$2,580,661
T & D	N/A	$382,881	$382,881	$382,881	$465,541
Marginal Energy	N/A	$5,206,932	$5,206,932	$5,206,932	$6,602,565
Environmental Externality	N/A	N/A	N/A	N/A	$837,984
Subtotal	N/A	$7,718,420	$7,718,420	$7,718,420	$10,486,751
Participant Benefits					
Bill Reduction - Electric	$21,976,224	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$1,199,464	N/A	N/A	$1,199,464	$1,199,464
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$3,909	N/A	N/A	$3,909	$4,464
Subtotal	$23,179,597	N/A	N/A	$1,203,373	$1,203,927
Total Benefits	$23,179,597	$7,718,420	$7,718,420	$8,921,793	$11,690,678
Costs					
Utility Project Costs					
Customer Services	N/A	$350,000	$350,000	$350,000	$350,000
Project Administration	N/A	$223,517	$223,517	$223,517	$223,517
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$1,200	$1,200	$1,200	$1,200
Rebates	N/A	$1,199,464	$1,199,464	$1,199,464	$1,199,464
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,774,181	$1,774,181	$1,774,181	$1,774,181
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$21,976,224	N/A	N/A
Subtotal	N/A	N/A	$21,976,224	N/A	N/A
Participant Costs					
Incremental Capital Costs	$3,740,560	N/A	N/A	$3,740,560	$3,740,560
Incremental O&M Costs	$666,202	N/A	N/A	$666,202	$835,949
Subtotal	$4,406,762	N/A	N/A	$4,406,762	$4,576,509
Total Costs	$4,406,762	$1,774,181	$23,750,405	$6,180,943	$6,350,690
Net Benefit (Cost)	**$18,772,835**	**$5,944,239**	**($16,031,985)**	**$2,740,850**	**$5,339,988**
Benefit/Cost Ratio	**5.26**	**4.35**	**0.32**	**1.44**	**1.84**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	19.3 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	7.52 kW
Gross Annual kWh Saved at Customer	36,989 kWh
Net Annual kWh Saved at Generator	39,624 kWh

Program Summary All Participants	
Total Participants	**311**
Total Budget	**$1,774,181**
Net coincident kW Saved at Generator	**2,340 kW**
Gross Annual kWh Saved at Customer	11,503,714 kWh
Net Annual kWh Saved at Generator	**12,323,207 kWh**

Utility Program Cost per kWh Lifetime	**$0.0075**
Utility Program Cost per kW at Gen	**$758**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **COMMERCIAL STREAMLINED ASSESSMENT**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 First Year	2022 Second Year	2023 Third Year
Administrative & Operating Costs =	$92,480	$92,715	$92,956
Incentive Costs =	$39,689	$44,577	$55,886
16) Total Utility Project Costs =	$132,169	$137,292	$148,842
17) Direct Participant Costs ($/Part.) =	$3,482	$3,998	$3,898
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	17.9	17.7	17.7
21) Avg. Dth/Part. Saved =	206.96	234.91	229.03
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	40	39	40
24) Total Annual Dth Saved =	8,278	9,161	9,161
25) Incentive/Participant =	$992.22	$1,143.00	$1,397.14

Cost Summary	1st Yr	2nd Yr	3rd Yr
Utility Cost per Participant =	$3,304	$3,520	$3,721
Cost per Participant per Dth =	$33	$32.01	$33.27
Lifetime Energy Reduction (Dth)	472,336		
Societal Cost per Dth	$1.84		

Test Results	Triennial NPV	Triennial B/C
Ratepayer Impact Measure Test	($1,067,148)	0.66
Utility Cost Test	$1,608,730	4.85
Societal Test	$2,689,363	4.09
Participant Test	$2,221,585	5.92

COMPRESSED AIR EFFICIENCY

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$933,067	$933,067	$933,067	$1,103,254
T & D	N/A	$164,880	$164,880	$164,880	$195,752
Marginal Energy	N/A	$2,307,495	$2,307,495	$2,307,495	$2,824,414
Environmental Externality	N/A	N/A	N/A	N/A	$459,682
Subtotal	N/A	$3,405,442	$3,405,442	$3,405,442	$4,583,102
Participant Benefits					
Bill Reduction - Electric	$10,148,363	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$871,256	N/A	N/A	$871,256	$871,256
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$71,281	N/A	N/A	$71,281	$84,247
Subtotal	$11,090,901	N/A	N/A	$942,538	$955,504
Total Benefits	$11,090,901	$3,405,442	$3,405,442	$4,347,980	$5,538,606
Costs					
Utility Project Costs					
Customer Services	N/A	$2,100	$2,100	$2,100	$2,100
Project Administration	N/A	$327,282	$327,282	$327,282	$327,282
Advertising & Promotion	N/A	$22,500	$22,500	$22,500	$22,500
Measurement & Verification	N/A	$15,000	$15,000	$15,000	$15,000
Rebates	N/A	$871,256	$871,256	$871,256	$871,256
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,238,138	$1,238,138	$1,238,138	$1,238,138
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$10,148,363	N/A	N/A
Subtotal	N/A	N/A	$10,148,363	N/A	N/A
Participant Costs					
Incremental Capital Costs	$1,921,871	N/A	N/A	$1,921,871	$1,921,871
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$1,921,871	N/A	N/A	$1,921,871	$1,921,871
Total Costs	$1,921,871	$1,238,138	$11,386,502	$3,160,009	$3,160,009
Net Benefit (Cost)	**$9,169,030**	**$2,167,304**	**($7,981,059)**	**$1,187,971**	**$2,378,597**
Benefit/Cost Ratio	**5.77**	**2.75**	**0.30**	**1.38**	**1.75**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	12.7 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	6.30 kW
Gross Annual kWh Saved at Customer	38,364 kWh
Net Annual kWh Saved at Generator	41,097 kWh

Program Summary All Participants	
Total Participants	**246**
Total Budget	**$1,238,138**
Net coincident kW Saved at Generator	**1,549 kW**
Gross Annual kWh Saved at Customer	9,437,445 kWh
Net Annual kWh Saved at Generator	**10,109,742 kWh**

Utility Program Cost per kWh Lifetime	**$0.0097**
Utility Program Cost per kW at Gen	**$799**

COMPRESSED AIR EFFICIENCY

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$1,051,381	$1,051,381	$1,051,381	$1,241,677
T & D	N/A	$184,951	$184,951	$184,951	$219,596
Marginal Energy	N/A	$2,702,591	$2,702,591	$2,702,591	$3,306,372
Environmental Externality	N/A	N/A	N/A	N/A	$630,348
Subtotal	N/A	$3,938,923	$3,938,923	$3,938,923	$5,397,993
Participant Benefits					
Bill Reduction - Electric	$11,452,414	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$962,643	N/A	N/A	$962,643	$962,643
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$76,617	N/A	N/A	$76,617	$90,569
Subtotal	$12,491,675	N/A	N/A	$1,039,260	$1,053,212
Total Benefits	$12,491,675	$3,938,923	$3,938,923	$4,978,184	$6,451,205
Costs					
Utility Project Costs					
Customer Services	N/A	$2,100	$2,100	$2,100	$2,100
Project Administration	N/A	$340,862	$340,862	$340,862	$340,862
Advertising & Promotion	N/A	$24,750	$24,750	$24,750	$24,750
Measurement & Verification	N/A	$16,500	$16,500	$16,500	$16,500
Rebates	N/A	$962,643	$962,643	$962,643	$962,643
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,346,855	$1,346,855	$1,346,855	$1,346,855
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$11,452,414	N/A	N/A
Subtotal	N/A	N/A	$11,452,414	N/A	N/A
Participant Costs					
Incremental Capital Costs	$2,101,765	N/A	N/A	$2,101,765	$2,101,765
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$2,101,765	N/A	N/A	$2,101,765	$2,101,765
Total Costs	$2,101,765	$1,346,855	$12,799,269	$3,448,620	$3,448,620
Net Benefit (Cost)	**$10,389,910**	**$2,592,068**	**($8,860,346)**	**$1,529,563**	**$3,002,585**
Benefit/Cost Ratio	**5.94**	**2.92**	**0.31**	**1.44**	**1.87**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	12.7 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	6.74 kW
Gross Annual kWh Saved at Customer	38,007 kWh
Net Annual kWh Saved at Generator	40,715 kWh

Program Summary All Participants	
Total Participants	**272**
Total Budget	**$1,346,855**
Net coincident kW Saved at Generator	**1,834 kW**
Gross Annual kWh Saved at Customer	10,337,982 kWh
Net Annual kWh Saved at Generator	**11,074,432 kWh**

Utility Program Cost per kWh Lifetime	**$0.0096**
Utility Program Cost per kW at Gen	**$734**

COMPRESSED AIR EFFICIENCY

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$1,197,805	$1,197,805	$1,197,805	$1,413,456
T & D	N/A	$210,152	$210,152	$210,152	$249,558
Marginal Energy	N/A	$3,241,718	$3,241,718	$3,241,718	$3,959,490
Environmental Externality	N/A	N/A	N/A	N/A	$564,358
Subtotal	N/A	$4,649,675	$4,649,675	$4,649,675	$6,186,862
Participant Benefits					
Bill Reduction - Electric	$13,154,045	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$1,064,068	N/A	N/A	$1,064,068	$1,064,068
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$86,148	N/A	N/A	$86,148	$101,794
Subtotal	$14,304,262	N/A	N/A	$1,150,217	$1,165,863
Total Benefits	$14,304,262	$4,649,675	$4,649,675	$5,799,891	$7,352,725
Costs					
Utility Project Costs					
Customer Services	N/A	$2,100	$2,100	$2,100	$2,100
Project Administration	N/A	$355,501	$355,501	$355,501	$355,501
Advertising & Promotion	N/A	$27,225	$27,225	$27,225	$27,225
Measurement & Verification	N/A	$18,150	$18,150	$18,150	$18,150
Rebates	N/A	$1,064,068	$1,064,068	$1,064,068	$1,064,068
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,467,044	$1,467,044	$1,467,044	$1,467,044
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$13,154,045	N/A	N/A
Subtotal	N/A	N/A	$13,154,045	N/A	N/A
Participant Costs					
Incremental Capital Costs	$2,330,641	N/A	N/A	$2,330,641	$2,330,641
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$2,330,641	N/A	N/A	$2,330,641	$2,330,641
Total Costs	$2,330,641	$1,467,044	$14,621,089	$3,797,685	$3,797,685
Net Benefit (Cost)	**$11,973,621**	**$3,182,630**	**($9,971,414)**	**$2,002,206**	**$3,555,040**
Benefit/Cost Ratio	**6.14**	**3.17**	**0.32**	**1.53**	**1.94**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	12.7 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	7.12 kW
Gross Annual kWh Saved at Customer	37,986 kWh
Net Annual kWh Saved at Generator	40,692 kWh

Program Summary All Participants	
Total Participants	**302**
Total Budget	**$1,467,044**
Net coincident kW Saved at Generator	**2,150 kW**
Gross Annual kWh Saved at Customer	11,471,630 kWh
Net Annual kWh Saved at Generator	**12,288,838 kWh**

Utility Program Cost per kWh Lifetime	**$0.0094**
Utility Program Cost per kW at Gen	**$682**

CUSTOM EFFICIENCY

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$573,896	$573,896	$573,896	$686,799
T & D	N/A	$102,601	$102,601	$102,601	$123,047
Marginal Energy	N/A	$1,679,266	$1,679,266	$1,679,266	$2,079,628
Environmental Externality	N/A	N/A	N/A	N/A	$307,909
Subtotal	N/A	$2,355,763	$2,355,763	$2,355,763	$3,197,383
Participant Benefits					
Bill Reduction - Electric	$7,523,535	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$376,695	N/A	N/A	$376,695	$376,695
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$28,477,662	N/A	N/A	$28,477,662	$35,005,578
Subtotal	$36,377,892	N/A	N/A	$28,854,357	$35,382,273
Total Benefits	$36,377,892	$2,355,763	$2,355,763	$31,210,120	$38,579,656
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$589,726	$589,726	$589,726	$589,726
Advertising & Promotion	N/A	$60	$60	$60	$60
Measurement & Verification	N/A	$10,000	$10,000	$10,000	$10,000
Rebates	N/A	$376,695	$376,695	$376,695	$376,695
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$976,481	$976,481	$976,481	$976,481
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$7,523,535	N/A	N/A
Subtotal	N/A	N/A	$7,523,535	N/A	N/A
Participant Costs					
Incremental Capital Costs	$8,041,001	N/A	N/A	$8,041,001	$8,041,001
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$8,041,001	N/A	N/A	$8,041,001	$8,041,001
Total Costs	$8,041,001	$976,481	$8,500,016	$9,017,482	$9,017,482
Net Benefit (Cost)	**$28,336,891**	**$1,379,281**	**($6,144,254)**	**$22,192,638**	**$29,562,174**
Benefit/Cost Ratio	**4.52**	**2.41**	**0.28**	**3.46**	**4.28**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	18.0 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	22.71 kW
Gross Annual kWh Saved at Customer	151,008 kWh
Net Annual kWh Saved at Generator	161,765 kWh

Program Summary All Participants	
Total Participants	**30**
Total Budget	**$976,481**
Net coincident kW Saved at Generator	**681 kW**
Gross Annual kWh Saved at Customer	4,530,230 kWh
Net Annual kWh Saved at Generator	**4,852,951 kWh**

Utility Program Cost per kWh Lifetime	**$0.0112**
Utility Program Cost per kW at Gen	**$1,433**

CUSTOM EFFICIENCY

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$585,374	$585,374	$585,374	$700,535
T & D	N/A	$105,026	$105,026	$105,026	$125,957
Marginal Energy	N/A	$1,778,104	$1,778,104	$1,778,104	$2,203,544
Environmental Externality	N/A	N/A	N/A	N/A	$363,046
Subtotal	N/A	$2,468,504	$2,468,504	$2,468,504	$3,393,082
Participant Benefits					
Bill Reduction - Electric	$7,763,564	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$376,695	N/A	N/A	$376,695	$376,695
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$28,477,662	N/A	N/A	$28,477,662	$35,005,578
Subtotal	$36,617,922	N/A	N/A	$28,854,357	$35,382,273
Total Benefits	$36,617,922	$2,468,504	$2,468,504	$31,322,862	$38,775,355
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$603,533	$603,533	$603,533	$603,533
Advertising & Promotion	N/A	$60	$60	$60	$60
Measurement & Verification	N/A	$10,000	$10,000	$10,000	$10,000
Rebates	N/A	$376,695	$376,695	$376,695	$376,695
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$990,288	$990,288	$990,288	$990,288
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$7,763,564	N/A	N/A
Subtotal	N/A	N/A	$7,763,564	N/A	N/A
Participant Costs					
Incremental Capital Costs	$8,041,001	N/A	N/A	$8,041,001	$8,041,001
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$8,041,001	N/A	N/A	$8,041,001	$8,041,001
Total Costs	$8,041,001	$990,288	$8,753,853	$9,031,289	$9,031,289
Net Benefit (Cost)	**$28,576,921**	**$1,478,216**	**($6,285,348)**	**$22,291,572**	**$29,744,066**
Benefit/Cost Ratio	**4.55**	**2.49**	**0.28**	**3.47**	**4.29**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	18.0 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	22.71 kW
Gross Annual kWh Saved at Customer	151,008 kWh
Net Annual kWh Saved at Generator	161,765 kWh

Program Summary All Participants	
Total Participants	**30**
Total Budget	**$990,288**
Net coincident kW Saved at Generator	**681 kW**
Gross Annual kWh Saved at Customer	4,530,230 kWh
Net Annual kWh Saved at Generator	**4,852,951 kWh**

Utility Program Cost per kWh Lifetime	**$0.0113**
Utility Program Cost per kW at Gen	**$1,454**

CUSTOM EFFICIENCY

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$597,083	$597,083	$597,083	$714,547
T & D	N/A	$107,511	$107,511	$107,511	$128,938
Marginal Energy	N/A	$1,898,935	$1,898,935	$1,898,935	$2,352,252
Environmental Externality	N/A	N/A	N/A	N/A	$303,949
Subtotal	N/A	$2,603,529	$2,603,529	$2,603,529	$3,499,687
Participant Benefits					
Bill Reduction - Electric	$8,018,421	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$376,695	N/A	N/A	$376,695	$376,695
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$28,477,662	N/A	N/A	$28,477,662	$35,005,578
Subtotal	$36,872,779	N/A	N/A	$28,854,357	$35,382,273
Total Benefits	$36,872,779	$2,603,529	$2,603,529	$31,457,887	$38,881,960
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$617,753	$617,753	$617,753	$617,753
Advertising & Promotion	N/A	$60	$60	$60	$60
Measurement & Verification	N/A	$10,000	$10,000	$10,000	$10,000
Rebates	N/A	$376,695	$376,695	$376,695	$376,695
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,004,508	$1,004,508	$1,004,508	$1,004,508
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$8,018,421	N/A	N/A
Subtotal	N/A	N/A	$8,018,421	N/A	N/A
Participant Costs					
Incremental Capital Costs	$8,041,001	N/A	N/A	$8,041,001	$8,041,001
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$8,041,001	N/A	N/A	$8,041,001	$8,041,001
Total Costs	$8,041,001	$1,004,508	$9,022,930	$9,045,509	$9,045,509
Net Benefit (Cost)	**$28,831,778**	**$1,599,021**	**($6,419,401)**	**$22,412,377**	**$29,836,451**
Benefit/Cost Ratio	**4.59**	**2.59**	**0.29**	**3.48**	**4.30**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	18.0 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	22.71 kW
Gross Annual kWh Saved at Customer	151,008 kWh
Net Annual kWh Saved at Generator	161,765 kWh

Program Summary All Participants	
Total Participants	**30**
Total Budget	**$1,004,508**
Net coincident kW Saved at Generator	**681 kW**
Gross Annual kWh Saved at Customer	4,530,230 kWh
Net Annual kWh Saved at Generator	**4,852,951 kWh**

Utility Program Cost per kWh Lifetime	**$0.0115**
Utility Program Cost per kW at Gen	**$1,474**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **CUSTOM EFFICIENCY**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$52,320	$53,377	$54,465
Incentive Costs =	$92,596	$92,596	$92,596
16) Total Utility Project Costs =	$144,916	$145,973	$147,061
17) Direct Participant Costs ($/Part.) =	$67,178	$67,178	$67,178
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$187,264	$187,264	$187,264
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	19.0	19.0	19.0
21) Avg. Dth/Part. Saved =	2,198.37	2,198.37	2,198.37
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	7	7	7
24) Total Annual Dth Saved =	15,389	15,389	15,389
25) Incentive/Participant =	$13,228.05	$13,228.05	$13,228.05

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$20,702	$20,853	$21,009
Cost per Participant per Dth =	$40	$40.04	$40.11
Lifetime Energy Reduction (Dth)	877,151		
Societal Cost per Dth	$2.11		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($1,637,075)	0.70
Utility Cost Test	$3,308,185	8.55
Societal Test	$10,129,345	6.48
Participant Test	$7,469,631	6.29

DATA CENTER EFFICIENCY

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$237,030	$237,030	$237,030	$282,153
T & D	N/A	$42,341	$42,341	$42,341	$50,513
Marginal Energy	N/A	$2,041,101	$2,041,101	$2,041,101	$2,558,320
Environmental Externality	N/A	N/A	N/A	N/A	$376,806
Subtotal	N/A	$2,320,473	$2,320,473	$2,320,473	$3,267,792
Participant Benefits					
Bill Reduction - Electric	$9,005,488	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$284,345	N/A	N/A	$284,345	$284,345
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$737,589	N/A	N/A	$737,589	$875,684
Subtotal	$10,027,422	N/A	N/A	$1,021,934	$1,160,029
Total Benefits	$10,027,422	$2,320,473	$2,320,473	$3,342,407	$4,427,821
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$117,985	$117,985	$117,985	$117,985
Advertising & Promotion	N/A	$21,000	$21,000	$21,000	$21,000
Measurement & Verification	N/A	$3,000	$3,000	$3,000	$3,000
Rebates	N/A	$284,345	$284,345	$284,345	$284,345
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$426,330	$426,330	$426,330	$426,330
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$9,005,488	N/A	N/A
Subtotal	N/A	N/A	$9,005,488	N/A	N/A
Participant Costs					
Incremental Capital Costs	$2,424,372	N/A	N/A	$2,424,372	$2,424,372
Incremental O&M Costs	$3,995	N/A	N/A	$3,995	$5,012
Subtotal	$2,428,367	N/A	N/A	$2,428,367	$2,429,385
Total Costs	$2,428,367	$426,330	$9,431,818	$2,854,697	$2,855,714
Net Benefit (Cost)	**$7,599,055**	**$1,894,143**	**($7,111,345)**	**$487,710**	**$1,572,107**
Benefit/Cost Ratio	**4.13**	**5.44**	**0.25**	**1.17**	**1.55**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	18.5 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	7.02 kW
Gross Annual kWh Saved at Customer	130,414 kWh
Net Annual kWh Saved at Generator	139,704 kWh

Program Summary All Participants	
Total Participants	**42**
Total Budget	**$426,330**
Net coincident kW Saved at Generator	**295 kW**
Gross Annual kWh Saved at Customer	5,477,376 kWh
Net Annual kWh Saved at Generator	**5,867,570 kWh**

Utility Program Cost per kWh Lifetime	**$0.0039**
Utility Program Cost per kW at Gen	**$1,447**

DATA CENTER EFFICIENCY

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$259,143	$259,143	$259,143	$305,168
T & D	N/A	$43,343	$43,343	$43,343	$51,708
Marginal Energy	N/A	$2,237,574	$2,237,574	$2,237,574	$2,808,338
Environmental Externality	N/A	N/A	N/A	N/A	$460,655
Subtotal	N/A	$2,540,059	$2,540,059	$2,540,059	$3,625,869
Participant Benefits					
Bill Reduction - Electric	$9,605,691	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$306,454	N/A	N/A	$306,454	$306,454
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$737,589	N/A	N/A	$737,589	$875,684
Subtotal	$10,649,734	N/A	N/A	$1,044,043	$1,182,138
Total Benefits	$10,649,734	$2,540,059	$2,540,059	$3,584,103	$4,808,007
Costs					
Utility Project Costs					
Customer Services	N/A	$2,470	$2,470	$2,470	$2,470
Project Administration	N/A	$119,882	$119,882	$119,882	$119,882
Advertising & Promotion	N/A	$21,000	$21,000	$21,000	$21,000
Measurement & Verification	N/A	$3,000	$3,000	$3,000	$3,000
Rebates	N/A	$306,454	$306,454	$306,454	$306,454
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$452,806	$452,806	$452,806	$452,806
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$9,605,691	N/A	N/A
Subtotal	N/A	N/A	$9,605,691	N/A	N/A
Participant Costs					
Incremental Capital Costs	$2,480,142	N/A	N/A	$2,480,142	$2,480,142
Incremental O&M Costs	$3,995	N/A	N/A	$3,995	$5,012
Subtotal	$2,484,137	N/A	N/A	$2,484,137	$2,485,155
Total Costs	$2,484,137	$452,806	$10,058,497	$2,936,943	$2,937,960
Net Benefit (Cost)	**$8,165,598**	**$2,087,254**	**($7,518,438)**	**$647,160**	**$1,870,046**
Benefit/Cost Ratio	**4.29**	**5.61**	**0.25**	**1.22**	**1.64**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	18.5 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	13.36 kW
Gross Annual kWh Saved at Customer	131,611 kWh
Net Annual kWh Saved at Generator	140,987 kWh

Program Summary All Participants	
Total Participants	**43**
Total Budget	**$452,806**
Net coincident kW Saved at Generator	**575 kW**
Gross Annual kWh Saved at Customer	5,659,272 kWh
Net Annual kWh Saved at Generator	**6,062,423 kWh**

Utility Program Cost per kWh Lifetime	**$0.0040**
Utility Program Cost per kW at Gen	**$788**

DATA CENTER EFFICIENCY

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$307,756	$307,756	$307,756	$364,276
T & D	N/A	$52,211	$52,211	$52,211	$62,529
Marginal Energy	N/A	$2,524,289	$2,524,289	$2,524,289	$3,169,669
Environmental Externality	N/A	N/A	N/A	N/A	$417,525
Subtotal	N/A	$2,884,256	$2,884,256	$2,884,256	$4,013,999
Participant Benefits					
Bill Reduction - Electric	$10,465,157	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$333,048	N/A	N/A	$333,048	$333,048
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$737,589	N/A	N/A	$737,589	$875,684
Subtotal	$11,535,794	N/A	N/A	$1,070,638	$1,208,733
Total Benefits	$11,535,794	$2,884,256	$2,884,256	$3,954,894	$5,222,732
Costs					
Utility Project Costs					
Customer Services	N/A	$200	$200	$200	$200
Project Administration	N/A	$121,527	$121,527	$121,527	$121,527
Advertising & Promotion	N/A	$21,000	$21,000	$21,000	$21,000
Measurement & Verification	N/A	$3,000	$3,000	$3,000	$3,000
Rebates	N/A	$333,048	$333,048	$333,048	$333,048
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$478,775	$478,775	$478,775	$478,775
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$10,465,157	N/A	N/A
Subtotal	N/A	N/A	$10,465,157	N/A	N/A
Participant Costs					
Incremental Capital Costs	$2,521,152	N/A	N/A	$2,521,152	$2,521,152
Incremental O&M Costs	$3,995	N/A	N/A	$3,995	$5,012
Subtotal	$2,525,147	N/A	N/A	$2,525,147	$2,526,165
Total Costs	$2,525,147	$478,775	$10,943,932	$3,003,922	$3,004,940
Net Benefit (Cost)	**$9,010,647**	**$2,405,481**	**($8,059,676)**	**$950,971**	**$2,217,792**
Benefit/Cost Ratio	**4.57**	**6.02**	**0.26**	**1.32**	**1.74**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	18.6 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	14.10 kW
Gross Annual kWh Saved at Customer	135,506 kWh
Net Annual kWh Saved at Generator	145,159 kWh

Program Summary All Participants	
Total Participants	**44**
Total Budget	**$478,775**
Net coincident kW Saved at Generator	**620 kW**
Gross Annual kWh Saved at Customer	5,962,254 kWh
Net Annual kWh Saved at Generator	**6,386,988 kWh**

Utility Program Cost per kWh Lifetime	**$0.0040**
Utility Program Cost per kW at Gen	**$772**

EFFICIENCY CONTROLS

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$133,245	$133,245	$133,245	$151,967
T & D	N/A	$20,240	$20,240	$20,240	$23,540
Marginal Energy	N/A	$3,019,830	$3,019,830	$3,019,830	$3,607,549
Environmental Externality	N/A	N/A	N/A	N/A	$589,331
Subtotal	N/A	$3,173,315	$3,173,315	$3,173,315	$4,372,387
Participant Benefits					
Bill Reduction - Electric	$13,259,524	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$536,310	N/A	N/A	$536,310	$536,310
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$1,130,668	N/A	N/A	$1,130,668	$1,347,041
Subtotal	$14,926,502	N/A	N/A	$1,666,978	$1,883,351
Total Benefits	$14,926,502	$3,173,315	$3,173,315	$4,840,293	$6,255,739
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$252,533	$252,533	$252,533	$252,533
Advertising & Promotion	N/A	$5,000	$5,000	$5,000	$5,000
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$536,310	$536,310	$536,310	$536,310
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$793,843	$793,843	$793,843	$793,843
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$13,259,524	N/A	N/A
Subtotal	N/A	N/A	$13,259,524	N/A	N/A
Participant Costs					
Incremental Capital Costs	$3,295,005	N/A	N/A	$3,295,005	$3,295,005
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$3,295,005	N/A	N/A	$3,295,005	$3,295,005
Total Costs	$3,295,005	$793,843	$14,053,367	$4,088,848	$4,088,848
Net Benefit (Cost)	**$11,631,497**	**$2,379,472**	**($10,880,052)**	**$751,445**	**$2,166,891**
Benefit/Cost Ratio	**4.53**	**4.00**	**0.23**	**1.18**	**1.53**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.0 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	6.48 kW
Gross Annual kWh Saved at Customer	158,250 kWh
Net Annual kWh Saved at Generator	169,523 kWh

Program Summary All Participants	
Total Participants	**68**
Total Budget	**$793,843**
Net coincident kW Saved at Generator	**441 kW**
Gross Annual kWh Saved at Customer	10,760,994 kWh
Net Annual kWh Saved at Generator	**11,527,577 kWh**

Utility Program Cost per kWh Lifetime	**$0.0046**
Utility Program Cost per kW at Gen	**$1,801**

EFFICIENCY CONTROLS

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$128,600	$128,600	$128,600	$146,517
T & D	N/A	$19,412	$19,412	$19,412	$22,578
Marginal Energy	N/A	$2,998,996	$2,998,996	$2,998,996	$3,577,543
Environmental Externality	N/A	N/A	N/A	N/A	$675,767
Subtotal	N/A	$3,147,008	$3,147,008	$3,147,008	$4,422,405
Participant Benefits					
Bill Reduction - Electric	$12,790,446	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$502,808	N/A	N/A	$502,808	$502,808
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$1,058,879	N/A	N/A	$1,058,879	$1,261,515
Subtotal	$14,352,134	N/A	N/A	$1,561,687	$1,764,322
Total Benefits	$14,352,134	$3,147,008	$3,147,008	$4,708,695	$6,186,727
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$230,625	$230,625	$230,625	$230,625
Advertising & Promotion	N/A	$5,000	$5,000	$5,000	$5,000
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$502,808	$502,808	$502,808	$502,808
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$738,433	$738,433	$738,433	$738,433
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$12,790,446	N/A	N/A
Subtotal	N/A	N/A	$12,790,446	N/A	N/A
Participant Costs					
Incremental Capital Costs	$3,085,893	N/A	N/A	$3,085,893	$3,085,893
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$3,085,893	N/A	N/A	$3,085,893	$3,085,893
Total Costs	$3,085,893	$738,433	$13,528,879	$3,824,326	$3,824,326
Net Benefit (Cost)	**$11,266,240**	**$2,408,575**	**($10,381,871)**	**$884,369**	**$2,362,401**
Benefit/Cost Ratio	**4.65**	**4.26**	**0.23**	**1.23**	**1.62**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.0 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	6.73 kW
Gross Annual kWh Saved at Customer	157,467 kWh
Net Annual kWh Saved at Generator	168,684 kWh

Program Summary All Participants	
Total Participants	**64**
Total Budget	**$738,433**
Net coincident kW Saved at Generator	**431 kW**
Gross Annual kWh Saved at Customer	10,077,886 kWh
Net Annual kWh Saved at Generator	**10,795,807 kWh**

Utility Program Cost per kWh Lifetime	**$0.0046**
Utility Program Cost per kW at Gen	**$1,713**

EFFICIENCY CONTROLS

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$129,309	$129,309	$129,309	$147,284
T & D	N/A	$19,536	$19,536	$19,536	$22,722
Marginal Energy	N/A	$3,148,972	$3,148,972	$3,148,972	$3,746,725
Environmental Externality	N/A	N/A	N/A	N/A	$550,508
Subtotal	N/A	$3,297,817	$3,297,817	$3,297,817	$4,467,239
Participant Benefits					
Bill Reduction - Electric	$12,965,615	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$494,432	N/A	N/A	$494,432	$494,432
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$1,040,932	N/A	N/A	$1,040,932	$1,240,133
Subtotal	$14,500,979	N/A	N/A	$1,535,364	$1,734,565
Total Benefits	$14,500,979	$3,297,817	$3,297,817	$4,833,182	$6,201,804
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$262,870	$262,870	$262,870	$262,870
Advertising & Promotion	N/A	$5,000	$5,000	$5,000	$5,000
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$494,432	$494,432	$494,432	$494,432
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$762,302	$762,302	$762,302	$762,302
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$12,965,615	N/A	N/A
Subtotal	N/A	N/A	$12,965,615	N/A	N/A
Participant Costs					
Incremental Capital Costs	$3,033,615	N/A	N/A	$3,033,615	$3,033,615
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$3,033,615	N/A	N/A	$3,033,615	$3,033,615
Total Costs	$3,033,615	$762,302	$13,727,917	$3,795,918	$3,795,918
Net Benefit (Cost)	**$11,467,364**	**$2,535,515**	**($10,430,100)**	**$1,037,264**	**$2,405,887**
Benefit/Cost Ratio	**4.78**	**4.33**	**0.24**	**1.27**	**1.63**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.0 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	6.80 kW
Gross Annual kWh Saved at Customer	157,256 kWh
Net Annual kWh Saved at Generator	168,458 kWh

Program Summary All Participants	
Total Participants	**63**
Total Budget	**$762,302**
Net coincident kW Saved at Generator	**429 kW**
Gross Annual kWh Saved at Customer	9,907,109 kWh
Net Annual kWh Saved at Generator	**10,612,865 kWh**

Utility Program Cost per kWh Lifetime	**$0.0048**
Utility Program Cost per kW at Gen	**$1,779**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **EFFICIENCY CONTROLS**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$9,314	$9,378	$9,443
Incentive Costs =	$52,071	$60,082	$72,098
16) Total Utility Project Costs =	$61,385	$69,460	$81,541
17) Direct Participant Costs ($/Part.) =	$47,312	$47,312	$47,312
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$13,684	$13,684	$13,684
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	15.0	15.0	15.0
21) Avg. Dth/Part. Saved =	801.09	801.09	801.09
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	13	15	18
24) Total Annual Dth Saved =	10,414	12,016	14,420
25) Incentive/Participant =	$4,005.47	$4,005.47	$4,005.47

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$4,722	$4,631	$4,530
Cost per Participant per Dth =	$65	$64.84	$64.71
Lifetime Energy Reduction (Dth)	552,755		
Societal Cost per Dth	$4.32		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($981,100)	0.71
Utility Cost Test	$2,189,123	11.31
Societal Test	$2,556,029	2.07
Participant Test	$1,657,882	1.76

ENERGY INFORMATION SYSTEMS

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$105,435	$105,435	$105,435	$119,129
T & D	N/A	$18,685	$18,685	$18,685	$21,149
Marginal Energy	N/A	$342,125	$342,125	$342,125	$386,996
Environmental Externality	N/A	N/A	N/A	N/A	$100,437
Subtotal	N/A	$466,244	$466,244	$466,244	$627,711
Participant Benefits					
Bill Reduction - Electric	$1,588,553	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$92,748	N/A	N/A	$92,748	$92,748
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$1,053	N/A	N/A	$1,053	$1,152
Subtotal	$1,682,354	N/A	N/A	$93,801	$93,900
Total Benefits	$1,682,354	$466,244	$466,244	$560,045	$721,610
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$449,093	$449,093	$449,093	$449,093
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$10,000	$10,000	$10,000	$10,000
Rebates	N/A	$92,748	$92,748	$92,748	$92,748
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$551,841	$551,841	$551,841	$551,841
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$1,588,553	N/A	N/A
Subtotal	N/A	N/A	$1,588,553	N/A	N/A
Participant Costs					
Incremental Capital Costs	$86,415	N/A	N/A	$86,415	$85,332
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$86,415	N/A	N/A	$86,415	$85,332
Total Costs	$86,415	$551,841	$2,140,394	$638,256	$637,173
Net Benefit (Cost)	**$1,595,939**	**($85,597)**	**($1,674,150)**	**($78,211)**	**$84,437**
Benefit/Cost Ratio	**19.47**	**0.84**	**0.22**	**0.88**	**1.13**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	5.9 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	10.82 kW
Gross Annual kWh Saved at Customer	134,477 kWh
Net Annual kWh Saved at Generator	144,057 kWh

Program Summary All Participants	
Total Participants	**24**
Total Budget	**$551,841**
Net coincident kW Saved at Generator	**260 kW**
Gross Annual kWh Saved at Customer	3,227,452 kWh
Net Annual kWh Saved at Generator	**3,457,366 kWh**

Utility Program Cost per kWh Lifetime	**$0.0270**
Utility Program Cost per kW at Gen	**$2,125**

ENERGY INFORMATION SYSTEMS

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$107,543	$107,543	$107,543	$121,511
T & D	N/A	$19,126	$19,126	$19,126	$21,649
Marginal Energy	N/A	$370,444	$370,444	$370,444	$418,245
Environmental Externality	N/A	N/A	N/A	N/A	$105,384
Subtotal	N/A	$497,113	$497,113	$497,113	$666,789
Participant Benefits					
Bill Reduction - Electric	$1,631,988	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$92,941	N/A	N/A	$92,941	$92,941
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$352	N/A	N/A	$352	$384
Subtotal	$1,725,280	N/A	N/A	$93,292	$93,325
Total Benefits	$1,725,280	$497,113	$497,113	$590,406	$760,114
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$493,117	$493,117	$493,117	$493,117
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$11,000	$11,000	$11,000	$11,000
Rebates	N/A	$92,941	$92,941	$92,941	$92,941
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$597,058	$597,058	$597,058	$597,058
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$1,631,988	N/A	N/A
Subtotal	N/A	N/A	$1,631,988	N/A	N/A
Participant Costs					
Incremental Capital Costs	$81,393	N/A	N/A	$81,393	$81,063
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$81,393	N/A	N/A	$81,393	$81,063
Total Costs	$81,393	$597,058	$2,229,046	$678,451	$678,121
Net Benefit (Cost)	**$1,643,887**	**($99,945)**	**($1,731,933)**	**($88,046)**	**$81,993**
Benefit/Cost Ratio	**21.20**	**0.83**	**0.22**	**0.87**	**1.12**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	5.9 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	10.82 kW
Gross Annual kWh Saved at Customer	134,477 kWh
Net Annual kWh Saved at Generator	144,057 kWh

Program Summary All Participants	
Total Participants	**24**
Total Budget	**$597,058**
Net coincident kW Saved at Generator	**260 kW**
Gross Annual kWh Saved at Customer	3,227,452 kWh
Net Annual kWh Saved at Generator	**3,457,366 kWh**

Utility Program Cost per kWh Lifetime	**$0.0292**
Utility Program Cost per kW at Gen	**$2,300**

ENERGY INFORMATION SYSTEMS

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$109,695	$109,695	$109,695	$123,942
T & D	N/A	$19,578	$19,578	$19,578	$22,160
Marginal Energy	N/A	$410,727	$410,727	$410,727	$461,392
Environmental Externality	N/A	N/A	N/A	N/A	$67,817
Subtotal	N/A	$539,999	$539,999	$539,999	$675,311
Participant Benefits					
Bill Reduction - Electric	$1,677,153	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$92,906	N/A	N/A	$92,906	$92,906
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$336	N/A	N/A	$336	$368
Subtotal	$1,770,395	N/A	N/A	$93,242	$93,274
Total Benefits	$1,770,395	$539,999	$539,999	$633,242	$768,585
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$541,694	$541,694	$541,694	$541,694
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$12,100	$12,100	$12,100	$12,100
Rebates	N/A	$92,906	$92,906	$92,906	$92,906
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$646,700	$646,700	$646,700	$646,700
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$1,677,153	N/A	N/A
Subtotal	N/A	N/A	$1,677,153	N/A	N/A
Participant Costs					
Incremental Capital Costs	$81,472	N/A	N/A	$81,472	$80,969
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$81,472	N/A	N/A	$81,472	$80,969
Total Costs	$81,472	$646,700	$2,323,853	$728,172	$727,669
Net Benefit (Cost)	**$1,688,923**	**($106,701)**	**($1,783,853)**	**($94,930)**	**$40,916**
Benefit/Cost Ratio	**21.73**	**0.84**	**0.23**	**0.87**	**1.06**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	5.9 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	10.82 kW
Gross Annual kWh Saved at Customer	134,477 kWh
Net Annual kWh Saved at Generator	144,057 kWh

Program Summary All Participants	
Total Participants	**24**
Total Budget	**$646,700**
Net coincident kW Saved at Generator	**260 kW**
Gross Annual kWh Saved at Customer	3,227,452 kWh
Net Annual kWh Saved at Generator	**3,457,366 kWh**

Utility Program Cost per kWh Lifetime	**$0.0316**
Utility Program Cost per kW at Gen	**$2,491**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **ENERGY INFORMATION SYSTEMS**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$27,298	$29,395	$31,682
Incentive Costs =	$39,617	$131,906	$133,124
16) Total Utility Project Costs =	$66,915	$161,301	$164,805
17) Direct Participant Costs ($/Part.) =	$135,034	$531,204	$530,289
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$21,970	$84,787	$84,961
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	7.0	7.0	7.0
21) Avg. Dth/Part. Saved =	3,562.67	12,469.33	12,469.33
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	3	3	3
24) Total Annual Dth Saved =	10,688	37,408	37,408
25) Incentive/Participant =	$13,205.61	$43,968.69	$44,374.55

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$22,305	$53,767	$54,935
Cost per Participant per Dth =	$44	$46.91	$46.93
Lifetime Energy Reduction (Dth)	598,528		
Societal Cost per Dth	$6.72		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($1,253,844)	0.68
Utility Cost Test	$2,296,242	6.84
Societal Test	$1,089,671	1.27
Participant Test	$750,658	1.21

ELECTRIC RATE SAVINGS

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$1,836,059	$1,836,059	$1,836,059	$1,919,293
T & D	N/A	$0	$0	$0	$0
Marginal Energy	N/A	$1,441	$1,441	$1,441	$1,521
Environmental Externality	N/A	N/A	N/A	N/A	$249
Subtotal	N/A	$1,837,500	$1,837,500	$1,837,500	$1,921,063
Participant Benefits					
Bill Reduction - Electric	$8,377	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$0	N/A	N/A	$0	$0
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$8,377	N/A	N/A	$0	$0
Total Benefits	$8,377	$1,837,500	$1,837,500	$1,837,500	$1,921,063
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$553,794	$553,794	$553,794	$553,794
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$0	$0	$0	$0
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$553,794	$553,794	$553,794	$553,794
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$8,377	N/A	N/A
Subtotal	N/A	N/A	$8,377	N/A	N/A
Participant Costs					
Incremental Capital Costs	$0	N/A	N/A	$0	$0
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$0	N/A	N/A	$0	$0
Total Costs	$0	$553,794	$562,171	$553,794	$553,794
Net Benefit (Cost)	**$8,377**	**$1,283,706**	**$1,275,329**	**$1,283,706**	**$1,367,269**
Benefit/Cost Ratio	**INF**	**3.32**	**3.27**	**3.32**	**3.47**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	5.0 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	178.69 kW
Gross Annual kWh Saved at Customer	329 kWh
Net Annual kWh Saved at Generator	352 kWh

Program Summary All Participants	
Total Participants	**36**
Total Budget	**$553,794**
Net coincident kW Saved at Generator	**6,433 kW**
Gross Annual kWh Saved at Customer	11,844 kWh
Net Annual kWh Saved at Generator	**12,688 kWh**

Utility Program Cost per kWh Lifetime	**$8.7296**
Utility Program Cost per kW at Gen	**$86**

ELECTRIC RATE SAVINGS

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$1,872,772	$1,872,772	$1,872,772	$1,957,671
T & D	N/A	$0	$0	$0	$0
Marginal Energy	N/A	$1,606	$1,606	$1,606	$1,695
Environmental Externality	N/A	N/A	N/A	N/A	$403
Subtotal	N/A	$1,874,378	$1,874,378	$1,874,378	$1,959,769
Participant Benefits					
Bill Reduction - Electric	$8,571	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$0	N/A	N/A	$0	$0
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$8,571	N/A	N/A	$0	$0
Total Benefits	$8,571	$1,874,378	$1,874,378	$1,874,378	$1,959,769
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$567,283	$567,283	$567,283	$567,283
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$0	$0	$0	$0
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$567,283	$567,283	$567,283	$567,283
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$8,571	N/A	N/A
Subtotal	N/A	N/A	$8,571	N/A	N/A
Participant Costs					
Incremental Capital Costs	$0	N/A	N/A	$0	$0
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$0	N/A	N/A	$0	$0
Total Costs	$0	$567,283	$575,854	$567,283	$567,283
Net Benefit (Cost)	**$8,571**	**$1,307,095**	**$1,298,523**	**$1,307,095**	**$1,392,486**
Benefit/Cost Ratio	**INF**	**3.30**	**3.25**	**3.30**	**3.45**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	5.0 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	178.69 kW
Gross Annual kWh Saved at Customer	329 kWh
Net Annual kWh Saved at Generator	352 kWh

Program Summary All Participants	
Total Participants	**36**
Total Budget	**$567,283**
Net coincident kW Saved at Generator	**6,433 kW**
Gross Annual kWh Saved at Customer	11,844 kWh
Net Annual kWh Saved at Generator	**12,688 kWh**

Utility Program Cost per kWh Lifetime	**$8.9422**
Utility Program Cost per kW at Gen	**$88**

ELECTRIC RATE SAVINGS

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$1,910,240	$1,910,240	$1,910,240	$1,996,837
T & D	N/A	$0	$0	$0	$0
Marginal Energy	N/A	$1,769	$1,769	$1,769	$1,862
Environmental Externality	N/A	N/A	N/A	N/A	$260
Subtotal	N/A	$1,912,009	$1,912,009	$1,912,009	$1,998,959
Participant Benefits					
Bill Reduction - Electric	$8,766	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$0	N/A	N/A	$0	$0
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$8,766	N/A	N/A	$0	$0
Total Benefits	$8,766	$1,912,009	$1,912,009	$1,912,009	$1,998,959
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$580,087	$580,087	$580,087	$580,087
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$0	$0	$0	$0
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$580,087	$580,087	$580,087	$580,087
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$8,766	N/A	N/A
Subtotal	N/A	N/A	$8,766	N/A	N/A
Participant Costs					
Incremental Capital Costs	$0	N/A	N/A	$0	$0
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$0	N/A	N/A	$0	$0
Total Costs	$0	$580,087	$588,853	$580,087	$580,087
Net Benefit (Cost)	**$8,766**	**$1,331,922**	**$1,323,156**	**$1,331,922**	**$1,418,872**
Benefit/Cost Ratio	**INF**	**3.30**	**3.25**	**3.30**	**3.45**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	5.0 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	178.69 kW
Gross Annual kWh Saved at Customer	329 kWh
Net Annual kWh Saved at Generator	352 kWh

Program Summary All Participants	
Total Participants	**36**
Total Budget	**$580,087**
Net coincident kW Saved at Generator	**6,433 kW**
Gross Annual kWh Saved at Customer	11,844 kWh
Net Annual kWh Saved at Generator	**12,688 kWh**

Utility Program Cost per kWh Lifetime	**$9.1441**
Utility Program Cost per kW at Gen	**$90**

FOODSERVICE EQUIPMENT

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$68,929	$68,929	$68,929	$82,842
T & D	N/A	$12,103	$12,103	$12,103	$14,604
Marginal Energy	N/A	$177,884	$177,884	$177,884	$222,691
Environmental Externality	N/A	N/A	N/A	N/A	$34,354
Subtotal	N/A	$258,916	$258,916	$258,916	$354,491
Participant Benefits					
Bill Reduction - Electric	$774,477	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$19,812	N/A	N/A	$19,812	$19,812
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$43,006	N/A	N/A	$43,006	$50,727
Subtotal	$837,295	N/A	N/A	$62,818	$70,539
Total Benefits	$837,295	$258,916	$258,916	$321,733	$425,030
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$19,710	$19,710	$19,710	$19,710
Advertising & Promotion	N/A	$9,000	$9,000	$9,000	$9,000
Measurement & Verification	N/A	$2,000	$2,000	$2,000	$2,000
Rebates	N/A	$19,812	$19,812	$19,812	$19,812
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$50,522	$50,522	$50,522	$50,522
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$774,477	N/A	N/A
Subtotal	N/A	N/A	$774,477	N/A	N/A
Participant Costs					
Incremental Capital Costs	$91,226	N/A	N/A	$91,226	$83,409
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$91,226	N/A	N/A	$91,226	$83,409
Total Costs	$91,226	$50,522	$824,999	$141,748	$133,931
Net Benefit (Cost)	**$746,068**	**$208,394**	**($566,084)**	**$179,985**	**$291,099**
Benefit/Cost Ratio	**9.18**	**5.12**	**0.31**	**2.27**	**3.17**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	18.1 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	1.32 kW
Gross Annual kWh Saved at Customer	8,120 kWh
Net Annual kWh Saved at Generator	8,699 kWh

Program Summary All Participants	
Total Participants	**63**
Total Budget	**$50,522**
Net coincident kW Saved at Generator	**83 kW**
Gross Annual kWh Saved at Customer	511,564 kWh
Net Annual kWh Saved at Generator	**548,006 kWh**

Utility Program Cost per kWh Lifetime	**$0.0051**
Utility Program Cost per kW at Gen	**$609**

FOODSERVICE EQUIPMENT

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$76,706	$76,706	$76,706	$91,973
T & D	N/A	$13,225	$13,225	$13,225	$15,931
Marginal Energy	N/A	$202,044	$202,044	$202,044	$252,368
Environmental Externality	N/A	N/A	N/A	N/A	$43,512
Subtotal	N/A	$291,975	$291,975	$291,975	$403,783
Participant Benefits					
Bill Reduction - Electric	$857,234	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$21,110	N/A	N/A	$21,110	$21,110
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$51,501	N/A	N/A	$51,501	$60,742
Subtotal	$929,845	N/A	N/A	$72,611	$81,852
Total Benefits	$929,845	$291,975	$291,975	$364,586	$485,636
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$21,557	$21,557	$21,557	$21,557
Advertising & Promotion	N/A	$10,600	$10,600	$10,600	$10,600
Measurement & Verification	N/A	$2,400	$2,400	$2,400	$2,400
Rebates	N/A	$21,110	$21,110	$21,110	$21,110
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$55,667	$55,667	$55,667	$55,667
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$857,234	N/A	N/A
Subtotal	N/A	N/A	$857,234	N/A	N/A
Participant Costs					
Incremental Capital Costs	$95,493	N/A	N/A	$95,493	$88,112
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$95,493	N/A	N/A	$95,493	$88,112
Total Costs	$95,493	$55,667	$912,901	$151,160	$143,780
Net Benefit (Cost)	**$834,352**	**$236,308**	**($620,926)**	**$213,426**	**$341,856**
Benefit/Cost Ratio	**9.74**	**5.24**	**0.32**	**2.41**	**3.38**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	17.9 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	1.32 kW
Gross Annual kWh Saved at Customer	8,022 kWh
Net Annual kWh Saved at Generator	8,593 kWh

Program Summary All Participants	
Total Participants	**69**
Total Budget	**$55,667**
Net coincident kW Saved at Generator	**91 kW**
Gross Annual kWh Saved at Customer	553,496 kWh
Net Annual kWh Saved at Generator	**592,926 kWh**

Utility Program Cost per kWh Lifetime	**$0.0053**
Utility Program Cost per kW at Gen	**$609**

FOODSERVICE EQUIPMENT

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$83,011	$83,011	$83,011	$99,398
T & D	N/A	$14,395	$14,395	$14,395	$17,312
Marginal Energy	N/A	$230,214	$230,214	$230,214	$286,639
Environmental Externality	N/A	N/A	N/A	N/A	$39,327
Subtotal	N/A	$327,619	$327,619	$327,619	$442,676
Participant Benefits					
Bill Reduction - Electric	$941,838	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$21,765	N/A	N/A	$21,765	$21,765
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$61,456	N/A	N/A	$61,456	$72,477
Subtotal	$1,025,059	N/A	N/A	$83,220	$94,242
Total Benefits	$1,025,059	$327,619	$327,619	$410,839	$536,918
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$23,655	$23,655	$23,655	$23,655
Advertising & Promotion	N/A	$12,520	$12,520	$12,520	$12,520
Measurement & Verification	N/A	$2,880	$2,880	$2,880	$2,880
Rebates	N/A	$21,765	$21,765	$21,765	$21,765
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$60,820	$60,820	$60,820	$60,820
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$941,838	N/A	N/A
Subtotal	N/A	N/A	$941,838	N/A	N/A
Participant Costs					
Incremental Capital Costs	$101,059	N/A	N/A	$101,059	$92,981
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$101,059	N/A	N/A	$101,059	$92,981
Total Costs	$101,059	$60,820	$1,002,658	$161,879	$153,801
Net Benefit (Cost)	**$923,999**	**$266,799**	**($675,039)**	**$248,960**	**$383,117**
Benefit/Cost Ratio	**10.14**	**5.39**	**0.33**	**2.54**	**3.49**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	17.7 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	1.32 kW
Gross Annual kWh Saved at Customer	8,046 kWh
Net Annual kWh Saved at Generator	8,619 kWh

Program Summary All Participants	
Total Participants	**74**
Total Budget	**$60,820**
Net coincident kW Saved at Generator	**98 kW**
Gross Annual kWh Saved at Customer	595,426 kWh
Net Annual kWh Saved at Generator	**637,843 kWh**

Utility Program Cost per kWh Lifetime	**$0.0054**
Utility Program Cost per kW at Gen	**$624**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **FOODSERVICE EQUIPMENT**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 First Year	2022 Second Year	2023 Third Year
Administrative & Operating Costs =	$48,303	$54,204	$61,125
Incentive Costs =	$50,236	$59,245	$68,779
16) Total Utility Project Costs =	$98,539	$113,449	$129,904
17) Direct Participant Costs ($/Part.) =	$2,270	$2,310	$2,004
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$150	$240	$201
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	13.6	13.4	13.4
21) Avg. Dth/Part. Saved =	79.19	82.20	71.61
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	122	142	163
24) Total Annual Dth Saved =	9,661	11,672	11,672
25) Incentive/Participant =	$411.77	$417.22	$421.96

Cost Summary	1st Yr	2nd Yr	3rd Yr
Utility Cost per Participant =	$808	$799	$797
Cost per Participant per Dth =	$39	$37.82	$39.11
Lifetime Energy Reduction (Dth)	443,383		
Societal Cost per Dth	$2.92		

Test Results	Triennial NPV	Triennial B/C
Ratepayer Impact Measure Test	($958,686)	0.67
Utility Cost Test	$1,585,007	5.64
Societal Test	$2,141,911	2.65
Participant Test	$1,765,916	2.90

HVAC+R

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$4,059,122	$4,059,122	$4,059,122	$4,811,890
T & D	N/A	$716,405	$716,405	$716,405	$851,351
Marginal Energy	N/A	$8,671,310	$8,671,310	$8,671,310	$10,514,693
Environmental Externality	N/A	N/A	N/A	N/A	$1,548,792
Subtotal	N/A	$13,446,837	$13,446,837	$13,446,837	$17,726,726
Participant Benefits					
Bill Reduction - Electric	$39,475,320	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$1,971,511	N/A	N/A	$1,971,511	$1,971,511
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$611,841	N/A	N/A	$611,841	$735,936
Subtotal	$42,058,672	N/A	N/A	$2,583,352	$2,707,446
Total Benefits	$42,058,672	$13,446,837	$13,446,837	$16,030,189	$20,434,173
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$1,427,166	$1,427,166	$1,427,166	$1,427,166
Advertising & Promotion	N/A	$144,000	$144,000	$144,000	$144,000
Measurement & Verification	N/A	$45,000	$45,000	$45,000	$45,000
Rebates	N/A	$1,971,511	$1,971,511	$1,971,511	$1,971,511
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$3,587,677	$3,587,677	$3,587,677	$3,587,677
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$39,475,320	N/A	N/A
Subtotal	N/A	N/A	$39,475,320	N/A	N/A
Participant Costs					
Incremental Capital Costs	$5,231,661	N/A	N/A	$5,231,661	$5,231,396
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$5,231,661	N/A	N/A	$5,231,661	$5,231,396
Total Costs	$5,231,661	$3,587,677	$43,062,997	$8,819,337	$8,819,073
Net Benefit (Cost)	**$36,827,011**	**$9,859,160**	**($29,616,160)**	**$7,210,852**	**$11,615,100**
Benefit/Cost Ratio	**8.04**	**3.75**	**0.31**	**1.82**	**2.32**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.1 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	2.11 kW
Gross Annual kWh Saved at Customer	10,825 kWh
Net Annual kWh Saved at Generator	11,596 kWh

Program Summary All Participants	
Total Participants	**2,415**
Total Budget	**$3,587,677**
Net coincident kW Saved at Generator	**5,104 kW**
Gross Annual kWh Saved at Customer	26,143,158 kWh
Net Annual kWh Saved at Generator	**28,005,526 kWh**

Utility Program Cost per kWh Lifetime	**$0.0080**
Utility Program Cost per kW at Gen	**$703**

HVAC+R

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$4,140,299	$4,140,299	$4,140,299	$4,908,123
T & D	N/A	$733,339	$733,339	$733,339	$871,481
Marginal Energy	N/A	$9,161,258	$9,161,258	$9,161,258	$11,110,839
Environmental Externality	N/A	N/A	N/A	N/A	$1,871,629
Subtotal	N/A	$14,034,897	$14,034,897	$14,034,897	$18,762,074
Participant Benefits					
Bill Reduction - Electric	$40,687,343	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$1,971,573	N/A	N/A	$1,971,573	$1,971,573
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$611,841	N/A	N/A	$611,841	$735,936
Subtotal	$43,270,757	N/A	N/A	$2,583,414	$2,707,508
Total Benefits	$43,270,757	$14,034,897	$14,034,897	$16,618,310	$21,469,582
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$1,523,270	$1,523,270	$1,523,270	$1,523,270
Advertising & Promotion	N/A	$158,000	$158,000	$158,000	$158,000
Measurement & Verification	N/A	$47,000	$47,000	$47,000	$47,000
Rebates	N/A	$1,971,573	$1,971,573	$1,971,573	$1,971,573
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$3,699,842	$3,699,842	$3,699,842	$3,699,842
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$40,687,343	N/A	N/A
Subtotal	N/A	N/A	$40,687,343	N/A	N/A
Participant Costs					
Incremental Capital Costs	$5,231,642	N/A	N/A	$5,231,642	$5,231,389
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$5,231,642	N/A	N/A	$5,231,642	$5,231,389
Total Costs	$5,231,642	$3,699,842	$44,387,186	$8,931,485	$8,931,231
Net Benefit (Cost)	**$38,039,115**	**$10,335,054**	**($30,352,289)**	**$7,686,826**	**$12,538,351**
Benefit/Cost Ratio	**8.27**	**3.79**	**0.32**	**1.86**	**2.40**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.1 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	2.11 kW
Gross Annual kWh Saved at Customer	10,825 kWh
Net Annual kWh Saved at Generator	11,596 kWh

Program Summary All Participants	
Total Participants	**2,415**
Total Budget	**$3,699,842**
Net coincident kW Saved at Generator	**5,104 kW**
Gross Annual kWh Saved at Customer	26,143,158 kWh
Net Annual kWh Saved at Generator	**28,005,526 kWh**

Utility Program Cost per kWh Lifetime	**$0.0082**
Utility Program Cost per kW at Gen	**$725**

HVAC+R

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$4,223,117	$4,223,117	$4,223,117	$5,006,299
T & D	N/A	$750,674	$750,674	$750,674	$892,087
Marginal Energy	N/A	$9,766,079	$9,766,079	$9,766,079	$11,833,539
Environmental Externality	N/A	N/A	N/A	N/A	$1,568,786
Subtotal	N/A	$14,739,870	$14,739,870	$14,739,870	$19,300,710
Participant Benefits					
Bill Reduction - Electric	$41,983,408	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$1,971,409	N/A	N/A	$1,971,409	$1,971,409
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$611,841	N/A	N/A	$611,841	$735,936
Subtotal	$44,566,659	N/A	N/A	$2,583,251	$2,707,345
Total Benefits	$44,566,659	$14,739,870	$14,739,870	$17,323,121	$22,008,055
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$1,584,843	$1,584,843	$1,584,843	$1,584,843
Advertising & Promotion	N/A	$167,000	$167,000	$167,000	$167,000
Measurement & Verification	N/A	$51,000	$51,000	$51,000	$51,000
Rebates	N/A	$1,971,409	$1,971,409	$1,971,409	$1,971,409
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$3,774,252	$3,774,252	$3,774,252	$3,774,252
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$41,983,408	N/A	N/A
Subtotal	N/A	N/A	$41,983,408	N/A	N/A
Participant Costs					
Incremental Capital Costs	$5,231,626	N/A	N/A	$5,231,626	$5,231,376
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$5,231,626	N/A	N/A	$5,231,626	$5,231,376
Total Costs	$5,231,626	$3,774,252	$45,757,660	$9,005,878	$9,005,628
Net Benefit (Cost)	**$39,335,033**	**$10,965,618**	**($31,017,790)**	**$8,317,243**	**$13,002,427**
Benefit/Cost Ratio	**8.52**	**3.91**	**0.32**	**1.92**	**2.44**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.1 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	2.11 kW
Gross Annual kWh Saved at Customer	10,825 kWh
Net Annual kWh Saved at Generator	11,596 kWh

Program Summary All Participants	
Total Participants	**2,415**
Total Budget	**$3,774,252**
Net coincident kW Saved at Generator	**5,104 kW**
Gross Annual kWh Saved at Customer	26,143,158 kWh
Net Annual kWh Saved at Generator	**28,005,526 kWh**

Utility Program Cost per kWh Lifetime	**$0.0084**
Utility Program Cost per kW at Gen	**$739**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **HVAC+R**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$499,882	$522,024	$629,962
Incentive Costs =	$829,572	$829,530	$829,639
16) Total Utility Project Costs =	$1,329,455	$1,351,553	$1,459,601
17) Direct Participant Costs ($/Part.) =	$2,158	$2,158	$2,158
18) Participant Non-Energy Costs (Annual $/Part.) =	$11	$12	$12
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$72	$72	$72
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	12.7	12.7	12.7
21) Avg. Dth/Part. Saved =	98.58	98.58	98.58
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	1,023	1,023	1,023
24) Total Annual Dth Saved =	100,846	100,846	100,846
25) Incentive/Participant =	$810.92	$810.88	$810.99

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$1,300	$1,321	$1,427
Cost per Participant per Dth =	$35	$35.42	$36.49
Lifetime Energy Reduction (Dth)	3,842,166		
Societal Cost per Dth	$2.81		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($9,410,368)	0.64
Utility Cost Test	$12,322,437	3.98
Societal Test	$19,748,823	2.83
Participant Test	$16,651,622	3.50

LIGHTING

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$16,595,134	$16,595,134	$16,595,134	$19,668,725
T & D	N/A	$2,962,244	$2,962,244	$2,962,244	$3,519,329
Marginal Energy	N/A	$45,367,352	$45,367,352	$45,367,352	$56,120,223
Environmental Externality	N/A	N/A	N/A	N/A	$8,407,243
Subtotal	N/A	$64,924,730	$64,924,730	$64,924,730	$87,715,520
Participant Benefits					
Bill Reduction - Electric	$198,775,490	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$9,547,694	N/A	N/A	$9,547,694	$9,547,694
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$208,323,184	N/A	N/A	$9,547,694	$9,547,694
Total Benefits	$208,323,184	$64,924,730	$64,924,730	$74,472,425	$97,263,214
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$4,205,191	$4,205,191	$4,205,191	$4,205,191
Advertising & Promotion	N/A	$250,000	$250,000	$250,000	$250,000
Measurement & Verification	N/A	$25,000	$25,000	$25,000	$25,000
Rebates	N/A	$9,547,694	$9,547,694	$9,547,694	$9,547,694
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$14,027,886	$14,027,886	$14,027,886	$14,027,886
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$198,775,490	N/A	N/A
Subtotal	N/A	N/A	$198,775,490	N/A	N/A
Participant Costs					
Incremental Capital Costs	$40,834,031	N/A	N/A	$40,834,031	$40,834,031
Incremental O&M Costs	$3,896,905	N/A	N/A	$3,896,905	$4,704,087
Subtotal	$44,730,936	N/A	N/A	$44,730,936	$45,538,118
Total Costs	$44,730,936	$14,027,886	$212,803,375	$58,758,822	$59,566,003
Net Benefit (Cost)	**$163,592,248**	**$50,896,845**	**($147,878,645)**	**$15,713,603**	**$37,697,211**
Benefit/Cost Ratio	**4.66**	**4.63**	**0.31**	**1.27**	**1.63**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.8 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	1.37 kW
Gross Annual kWh Saved at Customer	8,419 kWh
Net Annual kWh Saved at Generator	9,018 kWh

Program Summary All Participants	
Total Participants	**16,839**
Total Budget	**$14,027,886**
Net coincident kW Saved at Generator	**23,003 kW**
Gross Annual kWh Saved at Customer	141,764,745 kWh
Net Annual kWh Saved at Generator	**151,863,680 kWh**

Utility Program Cost per kWh Lifetime	**$0.0059**
Utility Program Cost per kW at Gen	**$610**

LIGHTING

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$15,848,488	$15,848,488	$15,848,488	$18,783,344
T & D	N/A	$2,839,075	$2,839,075	$2,839,075	$3,372,933
Marginal Energy	N/A	$45,438,235	$45,438,235	$45,438,235	$56,235,587
Environmental Externality	N/A	N/A	N/A	N/A	$9,547,586
Subtotal	N/A	$64,125,798	$64,125,798	$64,125,798	$87,939,449
Participant Benefits					
Bill Reduction - Electric	$193,376,910	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$9,158,644	N/A	N/A	$9,158,644	$9,158,644
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$202,535,555	N/A	N/A	$9,158,644	$9,158,644
Total Benefits	$202,535,555	$64,125,798	$64,125,798	$73,284,443	$97,098,093
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$4,257,679	$4,257,679	$4,257,679	$4,257,679
Advertising & Promotion	N/A	$250,000	$250,000	$250,000	$250,000
Measurement & Verification	N/A	$25,000	$25,000	$25,000	$25,000
Rebates	N/A	$9,158,644	$9,158,644	$9,158,644	$9,158,644
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$13,691,323	$13,691,323	$13,691,323	$13,691,323
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$193,376,910	N/A	N/A
Subtotal	N/A	N/A	$193,376,910	N/A	N/A
Participant Costs					
Incremental Capital Costs	$39,039,502	N/A	N/A	$39,039,502	$39,039,502
Incremental O&M Costs	$3,582,050	N/A	N/A	$3,582,050	$4,323,963
Subtotal	$42,621,552	N/A	N/A	$42,621,552	$43,363,464
Total Costs	$42,621,552	$13,691,323	$207,068,234	$56,312,875	$57,054,788
Net Benefit (Cost)	**$159,914,003**	**$50,434,475**	**($142,942,435)**	**$16,971,567**	**$40,043,306**
Benefit/Cost Ratio	**4.75**	**4.68**	**0.31**	**1.30**	**1.70**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.7 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	1.38 kW
Gross Annual kWh Saved at Customer	8,531 kWh
Net Annual kWh Saved at Generator	9,138 kWh

Program Summary All Participants	
Total Participants	**15,694**
Total Budget	**$13,691,323**
Net coincident kW Saved at Generator	**21,584 kW**
Gross Annual kWh Saved at Customer	133,878,186 kWh
Net Annual kWh Saved at Generator	**143,415,303 kWh**

Utility Program Cost per kWh Lifetime	**$0.0061**
Utility Program Cost per kW at Gen	**$634**

LIGHTING

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$15,877,128	$15,877,128	$15,877,128	$18,798,653
T & D	N/A	$2,853,984	$2,853,984	$2,853,984	$3,387,280
Marginal Energy	N/A	$47,926,584	$47,926,584	$47,926,584	$59,211,535
Environmental Externality	N/A	N/A	N/A	N/A	$7,781,787
Subtotal	N/A	$66,657,696	$66,657,696	$66,657,696	$89,179,254
Participant Benefits					
Bill Reduction - Electric	$196,665,539	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$9,064,539	N/A	N/A	$9,064,539	$9,064,539
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$205,730,079	N/A	N/A	$9,064,539	$9,064,539
Total Benefits	$205,730,079	$66,657,696	$66,657,696	$75,722,235	$98,243,794
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$4,311,741	$4,311,741	$4,311,741	$4,311,741
Advertising & Promotion	N/A	$250,000	$250,000	$250,000	$250,000
Measurement & Verification	N/A	$25,000	$25,000	$25,000	$25,000
Rebates	N/A	$9,064,539	$9,064,539	$9,064,539	$9,064,539
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$13,651,281	$13,651,281	$13,651,281	$13,651,281
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$196,665,539	N/A	N/A
Subtotal	N/A	N/A	$196,665,539	N/A	N/A
Participant Costs					
Incremental Capital Costs	$38,513,704	N/A	N/A	$38,513,704	$38,513,704
Incremental O&M Costs	$3,490,890	N/A	N/A	$3,490,890	$4,207,956
Subtotal	$42,004,594	N/A	N/A	$42,004,594	$42,721,659
Total Costs	$42,004,594	$13,651,281	$210,316,820	$55,655,875	$56,372,940
Net Benefit (Cost)	**$163,725,485**	**$53,006,415**	**($143,659,124)**	**$20,066,361**	**$41,870,854**
Benefit/Cost Ratio	**4.90**	**4.88**	**0.32**	**1.36**	**1.74**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.7 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	1.37 kW
Gross Annual kWh Saved at Customer	8,496 kWh
Net Annual kWh Saved at Generator	9,101 kWh

Program Summary All Participants	
Total Participants	**15,624**
Total Budget	**$13,651,281**
Net coincident kW Saved at Generator	**21,337 kW**
Gross Annual kWh Saved at Customer	132,740,654 kWh
Net Annual kWh Saved at Generator	**142,196,737 kWh**

Utility Program Cost per kWh Lifetime	**$0.0061**
Utility Program Cost per kW at Gen	**$640**

MULTI-FAMILY BUILDING EFFICIENCY

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$492,697	$492,697	$492,697	$582,222
T & D	N/A	$78,754	$78,754	$78,754	$93,473
Marginal Energy	N/A	$1,137,758	$1,137,758	$1,137,758	$1,400,831
Environmental Externality	N/A	N/A	N/A	N/A	$217,533
Subtotal	N/A	$1,709,209	$1,709,209	$1,709,209	$2,294,059
Participant Benefits					
Bill Reduction - Electric	$7,329,036	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$656,833	N/A	N/A	$656,833	$656,833
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$137,209	N/A	N/A	$137,209	$154,993
Subtotal	$8,123,077	N/A	N/A	$794,041	$811,826
Total Benefits	$8,123,077	$1,709,209	$1,709,209	$2,503,250	$3,105,885
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$943,868	$943,868	$943,868	$943,868
Advertising & Promotion	N/A	$10,800	$10,800	$10,800	$10,800
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$656,833	$656,833	$656,833	$656,833
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,611,500	$1,611,500	$1,611,500	$1,611,500
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$7,329,036	N/A	N/A
Subtotal	N/A	N/A	$7,329,036	N/A	N/A
Participant Costs					
Incremental Capital Costs	$1,178,469	N/A	N/A	$1,178,469	$1,178,469
Incremental O&M Costs	$3,160	N/A	N/A	$3,160	$3,925
Subtotal	$1,181,629	N/A	N/A	$1,181,629	$1,182,394
Total Costs	$1,181,629	$1,611,500	$8,940,537	$2,793,129	$2,793,894
Net Benefit (Cost)	**$6,941,448**	**$97,708**	**($7,231,328)**	**($289,880)**	**$311,990**
Benefit/Cost Ratio	**6.87**	**1.06**	**0.19**	**0.90**	**1.11**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.2 years
T & D Loss Factor (Energy)	7.35%
T & D Loss Factor (Demand)	8.75%
Net coincident kW Saved at Generator	0.09 kW
Gross Annual kWh Saved at Customer	521 kWh
Net Annual kWh Saved at Generator	550 kWh

Program Summary All Participants	
Total Participants	**7,208**
Total Budget	**$1,611,500**
Net coincident kW Saved at Generator	**679 kW**
Gross Annual kWh Saved at Customer	3,758,953 kWh
Net Annual kWh Saved at Generator	**3,965,236 kWh**

Utility Program Cost per kWh Lifetime	**$0.0267**
Utility Program Cost per kW at Gen	**$2,372**

MULTI-FAMILY BUILDING EFFICIENCY

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$508,761	$508,761	$508,761	$600,880
T & D	N/A	$81,179	$81,179	$81,179	$96,303
Marginal Energy	N/A	$1,207,149	$1,207,149	$1,207,149	$1,484,927
Environmental Externality	N/A	N/A	N/A	N/A	$261,126
Subtotal	N/A	$1,797,088	$1,797,088	$1,797,088	$2,443,237
Participant Benefits					
Bill Reduction - Electric	$7,548,491	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$659,378	N/A	N/A	$659,378	$659,378
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$138,690	N/A	N/A	$138,690	$156,666
Subtotal	$8,346,559	N/A	N/A	$798,068	$816,044
Total Benefits	$8,346,559	$1,797,088	$1,797,088	$2,595,156	$3,259,281
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$973,525	$973,525	$973,525	$973,525
Advertising & Promotion	N/A	$11,340	$11,340	$11,340	$11,340
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$659,378	$659,378	$659,378	$659,378
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,644,242	$1,644,242	$1,644,242	$1,644,242
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$7,548,491	N/A	N/A
Subtotal	N/A	N/A	$7,548,491	N/A	N/A
Participant Costs					
Incremental Capital Costs	$1,170,560	N/A	N/A	$1,170,560	$1,170,560
Incremental O&M Costs	$1,806	N/A	N/A	$1,806	$2,243
Subtotal	$1,172,366	N/A	N/A	$1,172,366	$1,172,803
Total Costs	$1,172,366	$1,644,242	$9,192,733	$2,816,609	$2,817,046
Net Benefit (Cost)	**$7,174,193**	**$152,846**	**($7,395,645)**	**($221,452)**	**$442,236**
Benefit/Cost Ratio	**7.12**	**1.09**	**0.20**	**0.92**	**1.16**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.1 years
T & D Loss Factor (Energy)	7.35%
T & D Loss Factor (Demand)	8.75%
Net coincident kW Saved at Generator	0.09 kW
Gross Annual kWh Saved at Customer	500 kWh
Net Annual kWh Saved at Generator	527 kWh

Program Summary All Participants	
Total Participants	**7,569**
Total Budget	**$1,644,242**
Net coincident kW Saved at Generator	**691 kW**
Gross Annual kWh Saved at Customer	3,784,048 kWh
Net Annual kWh Saved at Generator	**3,990,789 kWh**

Utility Program Cost per kWh Lifetime	**$0.0273**
Utility Program Cost per kW at Gen	**$2,380**

MULTI-FAMILY BUILDING EFFICIENCY

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$524,730	$524,730	$524,730	$619,649
T & D	N/A	$83,584	$83,584	$83,584	$99,151
Marginal Energy	N/A	$1,281,047	$1,281,047	$1,281,047	$1,572,685
Environmental Externality	N/A	N/A	N/A	N/A	$209,746
Subtotal	N/A	$1,889,361	$1,889,361	$1,889,361	$2,501,231
Participant Benefits					
Bill Reduction - Electric	$7,732,944	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$660,545	N/A	N/A	$660,545	$660,545
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$143,916	N/A	N/A	$143,916	$162,569
Subtotal	$8,537,404	N/A	N/A	$804,461	$823,114
Total Benefits	$8,537,404	$1,889,361	$1,889,361	$2,693,822	$3,324,346
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$1,019,924	$1,019,924	$1,019,924	$1,019,924
Advertising & Promotion	N/A	$11,907	$11,907	$11,907	$11,907
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$660,545	$660,545	$660,545	$660,545
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,692,376	$1,692,376	$1,692,376	$1,692,376
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$7,732,944	N/A	N/A
Subtotal	N/A	N/A	$7,732,944	N/A	N/A
Participant Costs					
Incremental Capital Costs	$1,159,623	N/A	N/A	$1,159,623	$1,159,623
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$1,159,623	N/A	N/A	$1,159,623	$1,159,623
Total Costs	$1,159,623	$1,692,376	$9,425,320	$2,851,999	$2,851,999
Net Benefit (Cost)	**$7,377,781**	**$196,985**	**($7,535,958)**	**($158,177)**	**$472,346**
Benefit/Cost Ratio	**7.36**	**1.12**	**0.20**	**0.94**	**1.17**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.0 years
T & D Loss Factor (Energy)	7.37%
T & D Loss Factor (Demand)	8.76%
Net coincident kW Saved at Generator	0.09 kW
Gross Annual kWh Saved at Customer	475 kWh
Net Annual kWh Saved at Generator	501 kWh

Program Summary All Participants	
Total Participants	**7,947**
Total Budget	**$1,692,376**
Net coincident kW Saved at Generator	**700 kW**
Gross Annual kWh Saved at Customer	3,778,001 kWh
Net Annual kWh Saved at Generator	**3,982,103 kWh**

Utility Program Cost per kWh Lifetime	**$0.0283**
Utility Program Cost per kW at Gen	**$2,419**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **MULTI-FAMILY BUILDING EFFICIENCY**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$422,761	$434,769	$449,326
Incentive Costs =	$190,219	$229,340	$252,632
16) Total Utility Project Costs =	$612,980	$664,109	$701,958
17) Direct Participant Costs ($/Part.) =	$254	$265	$252
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$962	$979	$932
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	10.8	10.7	10.7
21) Avg. Dth/Part. Saved =	7.96	9.07	8.64
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	2,402	2,523	2,649
24) Total Annual Dth Saved =	19,119	22,886	22,886
25) Incentive/Participant =	$79.19	$90.90	$95.37

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$255	$263	$265
Cost per Participant per Dth =	$64	$58.18	$59.84
Lifetime Energy Reduction (Dth)	695,420		
Societal Cost per Dth	$5.64		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($3,070,249)	0.50
Utility Cost Test	$1,064,018	1.54
Societal Test	$8,893,243	3.27
Participant Test	$9,996,202	6.14

PEAK PARTNER REWARDS

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$1,758,230	$1,758,230	$1,758,230	$1,758,230
T & D	N/A	$0	$0	$0	$0
Marginal Energy	N/A	$3,514	$3,514	$3,514	$3,514
Environmental Externality	N/A	N/A	N/A	N/A	($940)
Subtotal	N/A	$1,761,744	$1,761,744	$1,761,744	$1,760,804
Participant Benefits					
Bill Reduction - Electric	$22,850	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$852,540	N/A	N/A	$852,540	$852,540
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$875,390	N/A	N/A	$852,540	$852,540
Total Benefits	$875,390	$1,761,744	$1,761,744	$2,614,284	$2,613,344
Costs					
Utility Project Costs					
Customer Services	N/A	$37,050	$37,050	$37,050	$37,050
Project Administration	N/A	$550,905	$550,905	$550,905	$550,905
Advertising & Promotion	N/A	$25,000	$25,000	$25,000	$25,000
Measurement & Verification	N/A	$25,000	$25,000	$25,000	$25,000
Rebates	N/A	$852,540	$852,540	$852,540	$852,540
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,490,495	$1,490,495	$1,490,495	$1,490,495
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$22,850	N/A	N/A
Subtotal	N/A	N/A	$22,850	N/A	N/A
Participant Costs					
Incremental Capital Costs	$0	N/A	N/A	$0	$0
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$0	N/A	N/A	$0	$0
Total Costs	$0	$1,490,495	$1,513,345	$1,490,495	$1,490,495
Net Benefit (Cost)	**$875,390**	**$271,248**	**$248,398**	**$1,123,788**	**$1,122,849**
Benefit/Cost Ratio	**INF**	**1.18**	**1.16**	**1.75**	**1.75**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	1.0 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	962.90 kW
Gross Annual kWh Saved at Customer	5,312 kWh
Net Annual kWh Saved at Generator	5,690 kWh

Program Summary All Participants	
Total Participants	**30**
Total Budget	**$1,490,495**
Net coincident kW Saved at Generator	**28,887 kW**
Gross Annual kWh Saved at Customer	159,360 kWh
Net Annual kWh Saved at Generator	**170,712 kWh**

Utility Program Cost per kWh Lifetime	**$8.7310**
Utility Program Cost per kW at Gen	**$52**

PEAK PARTNER REWARDS

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$2,689,988	$2,689,988	$2,689,988	$2,689,988
T & D	N/A	$0	$0	$0	$0
Marginal Energy	N/A	$5,204	$5,204	$5,204	$5,204
Environmental Externality	N/A	N/A	N/A	N/A	$4,321
Subtotal	N/A	$2,695,192	$2,695,192	$2,695,192	$2,699,513
Participant Benefits					
Bill Reduction - Electric	$35,101	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$1,278,810	N/A	N/A	$1,278,810	$1,278,810
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$1,313,911	N/A	N/A	$1,278,810	$1,278,810
Total Benefits	$1,313,911	$2,695,192	$2,695,192	$3,974,002	$3,978,323
Costs					
Utility Project Costs					
Customer Services	N/A	$43,050	$43,050	$43,050	$43,050
Project Administration	N/A	$568,191	$568,191	$568,191	$568,191
Advertising & Promotion	N/A	$25,000	$25,000	$25,000	$25,000
Measurement & Verification	N/A	$25,000	$25,000	$25,000	$25,000
Rebates	N/A	$1,278,810	$1,278,810	$1,278,810	$1,278,810
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,940,051	$1,940,051	$1,940,051	$1,940,051
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$35,101	N/A	N/A
Subtotal	N/A	N/A	$35,101	N/A	N/A
Participant Costs					
Incremental Capital Costs	$0	N/A	N/A	$0	$0
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$0	N/A	N/A	$0	$0
Total Costs	$0	$1,940,051	$1,975,151	$1,940,051	$1,940,051
Net Benefit (Cost)	**$1,313,911**	**$755,142**	**$720,041**	**$2,033,952**	**$2,038,273**
Benefit/Cost Ratio	**INF**	**1.39**	**1.36**	**2.05**	**2.05**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	1.0 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	962.90 kW
Gross Annual kWh Saved at Customer	5,312 kWh
Net Annual kWh Saved at Generator	5,690 kWh

Program Summary All Participants	
Total Participants	**45**
Total Budget	**$1,940,051**
Net coincident kW Saved at Generator	**43,331 kW**
Gross Annual kWh Saved at Customer	239,040 kWh
Net Annual kWh Saved at Generator	**256,069 kWh**

Utility Program Cost per kWh Lifetime	**$7.5763**
Utility Program Cost per kW at Gen	**$45**

PEAK PARTNER REWARDS

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$3,658,550	$3,658,550	$3,658,550	$3,658,550
T & D	N/A	$0	$0	$0	$0
Marginal Energy	N/A	$8,351	$8,351	$8,351	$8,351
Environmental Externality	N/A	N/A	N/A	N/A	$3,952
Subtotal	N/A	$3,666,902	$3,666,902	$3,666,902	$3,670,854
Participant Benefits					
Bill Reduction - Electric	$47,944	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$1,705,080	N/A	N/A	$1,705,080	$1,705,080
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$1,753,024	N/A	N/A	$1,705,080	$1,705,080
Total Benefits	$1,753,024	$3,666,902	$3,666,902	$5,371,982	$5,375,934
Costs					
Utility Project Costs					
Customer Services	N/A	$52,050	$52,050	$52,050	$52,050
Project Administration	N/A	$585,652	$585,652	$585,652	$585,652
Advertising & Promotion	N/A	$25,000	$25,000	$25,000	$25,000
Measurement & Verification	N/A	$25,000	$25,000	$25,000	$25,000
Rebates	N/A	$1,705,080	$1,705,080	$1,705,080	$1,705,080
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$2,392,782	$2,392,782	$2,392,782	$2,392,782
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$47,944	N/A	N/A
Subtotal	N/A	N/A	$47,944	N/A	N/A
Participant Costs					
Incremental Capital Costs	$0	N/A	N/A	$0	$0
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$0	N/A	N/A	$0	$0
Total Costs	$0	$2,392,782	$2,440,726	$2,392,782	$2,392,782
Net Benefit (Cost)	**$1,753,024**	**$1,274,120**	**$1,226,176**	**$2,979,200**	**$2,983,152**
Benefit/Cost Ratio	**INF**	**1.53**	**1.50**	**2.25**	**2.25**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	1.0 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	962.90 kW
Gross Annual kWh Saved at Customer	5,312 kWh
Net Annual kWh Saved at Generator	5,690 kWh

Program Summary All Participants	
Total Participants	**60**
Total Budget	**$2,392,782**
Net coincident kW Saved at Generator	**57,774 kW**
Gross Annual kWh Saved at Customer	318,720 kWh
Net Annual kWh Saved at Generator	**341,425 kWh**

Utility Program Cost per kWh Lifetime	**$7.0082**
Utility Program Cost per kW at Gen	**$41**

PROCESS EFFICIENCY

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$10,205,429	$10,205,429	$10,205,429	$12,117,966
T & D	N/A	$1,807,806	$1,807,806	$1,807,806	$2,153,341
Marginal Energy	N/A	$23,365,621	$23,365,621	$23,365,621	$28,644,003
Environmental Externality	N/A	N/A	N/A	N/A	$4,238,660
Subtotal	N/A	$35,378,856	$35,378,856	$35,378,856	$47,153,970
Participant Benefits					
Bill Reduction - Electric	$104,759,537	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$4,193,883	N/A	N/A	$4,193,883	$4,193,883
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$61,558,958	N/A	N/A	$61,558,958	$75,669,985
Subtotal	$170,512,378	N/A	N/A	$65,752,841	$79,863,868
Total Benefits	$170,512,378	$35,378,856	$35,378,856	$101,131,697	$127,017,839
Costs					
Utility Project Costs					
Customer Services	N/A	$804,940	$804,940	$804,940	$804,940
Project Administration	N/A	$1,789,793	$1,789,793	$1,789,793	$1,789,793
Advertising & Promotion	N/A	$25,000	$25,000	$25,000	$25,000
Measurement & Verification	N/A	$26,000	$26,000	$26,000	$26,000
Rebates	N/A	$4,193,883	$4,193,883	$4,193,883	$4,193,883
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$6,839,616	$6,839,616	$6,839,616	$6,839,616
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$104,759,537	N/A	N/A
Subtotal	N/A	N/A	$104,759,537	N/A	N/A
Participant Costs					
Incremental Capital Costs	$25,202,346	N/A	N/A	$25,202,346	$25,202,346
Incremental O&M Costs	$838,417	N/A	N/A	$838,417	$999,553
Subtotal	$26,040,763	N/A	N/A	$26,040,763	$26,201,899
Total Costs	$26,040,763	$6,839,616	$111,599,153	$32,880,379	$33,041,515
Net Benefit (Cost)	**$144,471,615**	**$28,539,240**	**($76,220,297)**	**$68,251,318**	**$93,976,324**
Benefit/Cost Ratio	**6.55**	**5.17**	**0.32**	**3.08**	**3.84**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.8 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	36.60 kW
Gross Annual kWh Saved at Customer	187,089 kWh
Net Annual kWh Saved at Generator	200,416 kWh

Program Summary All Participants	
Total Participants	**360**
Total Budget	**$6,839,616**
Net coincident kW Saved at Generator	**13,177 kW**
Gross Annual kWh Saved at Customer	67,351,954 kWh
Net Annual kWh Saved at Generator	**72,149,924 kWh**

Utility Program Cost per kWh Lifetime	**$0.0056**
Utility Program Cost per kW at Gen	**$519**

PROCESS EFFICIENCY

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$10,594,087	$10,594,087	$10,594,087	$12,564,024
T & D	N/A	$1,868,453	$1,868,453	$1,868,453	$2,225,205
Marginal Energy	N/A	$25,060,823	$25,060,823	$25,060,823	$30,727,341
Environmental Externality	N/A	N/A	N/A	N/A	$5,123,474
Subtotal	N/A	$37,523,362	$37,523,362	$37,523,362	$50,640,043
Participant Benefits					
Bill Reduction - Electric	$109,535,818	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$4,313,419	N/A	N/A	$4,313,419	$4,313,419
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$61,559,047	N/A	N/A	$61,559,047	$75,670,086
Subtotal	$175,408,283	N/A	N/A	$65,872,466	$79,983,505
Total Benefits	$175,408,283	$37,523,362	$37,523,362	$103,395,827	$130,623,548
Costs					
Utility Project Costs					
Customer Services	N/A	$805,575	$805,575	$805,575	$805,575
Project Administration	N/A	$1,969,377	$1,969,377	$1,969,377	$1,969,377
Advertising & Promotion	N/A	$25,000	$25,000	$25,000	$25,000
Measurement & Verification	N/A	$16,000	$16,000	$16,000	$16,000
Rebates	N/A	$4,313,419	$4,313,419	$4,313,419	$4,313,419
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$7,129,371	$7,129,371	$7,129,371	$7,129,371
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$109,535,818	N/A	N/A
Subtotal	N/A	N/A	$109,535,818	N/A	N/A
Participant Costs					
Incremental Capital Costs	$25,382,757	N/A	N/A	$25,382,757	$25,382,757
Incremental O&M Costs	$862,061	N/A	N/A	$862,061	$1,027,721
Subtotal	$26,244,818	N/A	N/A	$26,244,818	$26,410,478
Total Costs	$26,244,818	$7,129,371	$116,665,189	$33,374,189	$33,539,849
Net Benefit (Cost)	**$149,163,466**	**$30,393,991**	**($79,141,827)**	**$70,021,639**	**$97,083,699**
Benefit/Cost Ratio	**6.68**	**5.26**	**0.32**	**3.10**	**3.89**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.7 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	37.77 kW
Gross Annual kWh Saved at Customer	184,687 kWh
Net Annual kWh Saved at Generator	197,843 kWh

Program Summary All Participants	
Total Participants	**371**
Total Budget	**$7,129,371**
Net coincident kW Saved at Generator	**14,011 kW**
Gross Annual kWh Saved at Customer	68,518,797 kWh
Net Annual kWh Saved at Generator	**73,399,890 kWh**

Utility Program Cost per kWh Lifetime	**$0.0058**
Utility Program Cost per kW at Gen	**$509**

PROCESS EFFICIENCY

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$10,905,575	$10,905,575	$10,905,575	$12,923,747
T & D	N/A	$1,924,098	$1,924,098	$1,924,098	$2,290,819
Marginal Energy	N/A	$27,028,070	$27,028,070	$27,028,070	$33,101,881
Environmental Externality	N/A	N/A	N/A	N/A	$4,312,627
Subtotal	N/A	$39,857,743	$39,857,743	$39,857,743	$52,629,073
Participant Benefits					
Bill Reduction - Electric	$114,263,536	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$4,440,209	N/A	N/A	$4,440,209	$4,440,209
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$61,559,135	N/A	N/A	$61,559,135	$75,670,188
Subtotal	$180,262,880	N/A	N/A	$65,999,344	$80,110,396
Total Benefits	$180,262,880	$39,857,743	$39,857,743	$105,857,087	$132,739,470
Costs					
Utility Project Costs					
Customer Services	N/A	$806,085	$806,085	$806,085	$806,085
Project Administration	N/A	$1,999,756	$1,999,756	$1,999,756	$1,999,756
Advertising & Promotion	N/A	$25,000	$25,000	$25,000	$25,000
Measurement & Verification	N/A	$16,000	$16,000	$16,000	$16,000
Rebates	N/A	$4,440,209	$4,440,209	$4,440,209	$4,440,209
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$7,287,050	$7,287,050	$7,287,050	$7,287,050
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$114,263,536	N/A	N/A
Subtotal	N/A	N/A	$114,263,536	N/A	N/A
Participant Costs					
Incremental Capital Costs	$25,571,504	N/A	N/A	$25,571,504	$25,571,504
Incremental O&M Costs	$877,410	N/A	N/A	$877,410	$1,045,855
Subtotal	$26,448,913	N/A	N/A	$26,448,913	$26,617,359
Total Costs	$26,448,913	$7,287,050	$121,550,585	$33,735,963	$33,904,408
Net Benefit (Cost)	**$153,813,966**	**$32,570,693**	**($81,692,842)**	**$72,121,124**	**$98,835,061**
Benefit/Cost Ratio	**6.82**	**5.47**	**0.33**	**3.14**	**3.92**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant

Lifetime (Weighted on Generator kWh)	16.7 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	38.20 kW
Gross Annual kWh Saved at Customer	181,468 kWh
Net Annual kWh Saved at Generator	194,396 kWh

Program Summary All Participants

Total Participants	**383**
Total Budget	**$7,287,050**
Net coincident kW Saved at Generator	**14,631 kW**
Gross Annual kWh Saved at Customer	69,502,334 kWh
Net Annual kWh Saved at Generator	**74,453,491 kWh**
Utility Program Cost per kWh Lifetime	**$0.0059**
Utility Program Cost per kW at Gen	**$498**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **PROCESS EFFICIENCY**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$283,266	$289,540	$294,970
Incentive Costs =	$783,860	$780,298	$770,281
16) Total Utility Project Costs =	$1,067,126	$1,069,838	$1,065,251
17) Direct Participant Costs ($/Part.) =	$89,923	$86,666	$88,550
18) Participant Non-Energy Costs (Annual $/Part.) =	$13	$14	$15
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$40,268	$40,268	$41,143
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	12.3	12.2	12.2
21) Avg. Dth/Part. Saved =	4,875.01	4,832.15	4,937.20
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	47	47	46
24) Total Annual Dth Saved =	229,125	227,111	227,111
25) Incentive/Participant =	$16,677.88	$16,602.08	$16,745.25

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$22,705	$22,763	$23,158
Cost per Participant per Dth =	$23	$22.65	$22.63
Lifetime Energy Reduction (Dth)	8,359,423		
Societal Cost per Dth	$1.86		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($14,861,558)	0.71
Utility Cost Test	$33,222,274	11.37
Societal Test	$52,501,065	4.37
Participant Test	$42,001,354	4.39

COMMERCIAL AC CONTROL

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$2,518,826	$2,518,826	$2,518,826	$2,850,266
T & D	N/A	$0	$0	$0	$0
Marginal Energy	N/A	$80,607	$80,607	$80,607	$90,257
Environmental Externality	N/A	N/A	N/A	N/A	$14,021
Subtotal	N/A	$2,599,432	$2,599,432	$2,599,432	$2,954,544
Participant Benefits					
Bill Reduction - Electric	$7,177,753	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$329,818	N/A	N/A	$329,818	$329,818
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$7,507,571	N/A	N/A	$329,818	$329,818
Total Benefits	$7,507,571	$2,599,432	$2,599,432	$2,929,251	$3,284,362
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$2,212,990	$2,212,990	$2,212,990	$2,212,990
Advertising & Promotion	N/A	$200,000	$200,000	$200,000	$200,000
Measurement & Verification	N/A	$200,000	$200,000	$200,000	$200,000
Rebates	N/A	$329,818	$329,818	$329,818	$329,818
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$2,942,808	$2,942,808	$2,942,808	$2,942,808
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$7,177,753	N/A	N/A
Subtotal	N/A	N/A	$7,177,753	N/A	N/A
Participant Costs					
Incremental Capital Costs	$331,657	N/A	N/A	$331,657	$330,937
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$331,657	N/A	N/A	$331,657	$330,937
Total Costs	$331,657	$2,942,808	$10,120,561	$3,274,465	$3,273,745
Net Benefit (Cost)	**$7,175,914**	**($343,376)**	**($7,521,129)**	**($345,215)**	**$10,617**
Benefit/Cost Ratio	**22.64**	**0.88**	**0.26**	**0.89**	**1.00**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC **GOAL**

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	9.9 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	1.20 kW
Gross Annual kWh Saved at Customer	93 kWh
Net Annual kWh Saved at Generator	99 kWh

Program Summary All Participants	
Total Participants	**4,017**
Total Budget	**$2,942,808**
Net coincident kW Saved at Generator	**4,815 kW**
Gross Annual kWh Saved at Customer	371,721 kWh
Net Annual kWh Saved at Generator	**398,201 kWh**

Utility Program Cost per kWh Lifetime	**$0.7500**
Utility Program Cost per kW at Gen	**$611**

COMMERCIAL AC CONTROL

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$2,898,665	$2,898,665	$2,898,665	$3,251,670
T & D	N/A	$0	$0	$0	$0
Marginal Energy	N/A	$123,634	$123,634	$123,634	$138,151
Environmental Externality	N/A	N/A	N/A	N/A	$26,066
Subtotal	N/A	$3,022,299	$3,022,299	$3,022,299	$3,415,887
Participant Benefits					
Bill Reduction - Electric	$7,363,378	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$485,275	N/A	N/A	$485,275	$485,275
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$7,848,653	N/A	N/A	$485,275	$485,275
Total Benefits	$7,848,653	$3,022,299	$3,022,299	$3,507,574	$3,901,162
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$2,514,855	$2,514,855	$2,514,855	$2,514,855
Advertising & Promotion	N/A	$200,000	$200,000	$200,000	$200,000
Measurement & Verification	N/A	$200,000	$200,000	$200,000	$200,000
Rebates	N/A	$485,275	$485,275	$485,275	$485,275
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$3,400,130	$3,400,130	$3,400,130	$3,400,130
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$7,363,378	N/A	N/A
Subtotal	N/A	N/A	$7,363,378	N/A	N/A
Participant Costs					
Incremental Capital Costs	$490,001	N/A	N/A	$490,001	$488,657
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$490,001	N/A	N/A	$490,001	$488,657
Total Costs	$490,001	$3,400,130	$10,763,508	$3,890,132	$3,888,787
Net Benefit (Cost)	**$7,358,652**	**($377,831)**	**($7,741,209)**	**($382,557)**	**$12,376**
Benefit/Cost Ratio	**16.02**	**0.89**	**0.28**	**0.90**	**1.00**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	9.8 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	1.20 kW
Gross Annual kWh Saved at Customer	110 kWh
Net Annual kWh Saved at Generator	117 kWh

Program Summary All Participants	
Total Participants	**4,950**
Total Budget	**$3,400,130**
Net coincident kW Saved at Generator	**5,947 kW**
Gross Annual kWh Saved at Customer	542,395 kWh
Net Annual kWh Saved at Generator	**581,034 kWh**

Utility Program Cost per kWh Lifetime	**$0.5950**
Utility Program Cost per kW at Gen	**$572**

COMMERCIAL AC CONTROL

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$3,292,711	$3,292,711	$3,292,711	$3,668,012
T & D	N/A	$0	$0	$0	$0
Marginal Energy	N/A	$178,010	$178,010	$178,010	$198,184
Environmental Externality	N/A	N/A	N/A	N/A	$24,691
Subtotal	N/A	$3,470,721	$3,470,721	$3,470,721	$3,890,886
Participant Benefits					
Bill Reduction - Electric	$7,586,180	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$660,061	N/A	N/A	$660,061	$660,061
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$8,246,240	N/A	N/A	$660,061	$660,061
Total Benefits	$8,246,240	$3,470,721	$3,470,721	$4,130,782	$4,550,947
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$2,576,791	$2,576,791	$2,576,791	$2,576,791
Advertising & Promotion	N/A	$200,000	$200,000	$200,000	$200,000
Measurement & Verification	N/A	$200,000	$200,000	$200,000	$200,000
Rebates	N/A	$660,061	$660,061	$660,061	$660,061
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$3,636,851	$3,636,851	$3,636,851	$3,636,851
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$7,586,180	N/A	N/A
Subtotal	N/A	N/A	$7,586,180	N/A	N/A
Participant Costs					
Incremental Capital Costs	$665,079	N/A	N/A	$665,079	$663,349
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$665,079	N/A	N/A	$665,079	$663,349
Total Costs	$665,079	$3,636,851	$11,223,031	$4,301,930	$4,300,200
Net Benefit (Cost)	**$7,581,162**	**($166,130)**	**($7,752,310)**	**($171,148)**	**$250,747**
Benefit/Cost Ratio	**12.40**	**0.95**	**0.31**	**0.96**	**1.06**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	9.8 years
T & D Loss Factor (Energy)	6.65%
T & D Loss Factor (Demand)	8.06%
Net coincident kW Saved at Generator	1.19 kW
Gross Annual kWh Saved at Customer	124 kWh
Net Annual kWh Saved at Generator	133 kWh

Program Summary All Participants	
Total Participants	**5,950**
Total Budget	**$3,636,851**
Net coincident kW Saved at Generator	**7,079 kW**
Gross Annual kWh Saved at Customer	738,395 kWh
Net Annual kWh Saved at Generator	**790,996 kWh**

Utility Program Cost per kWh Lifetime	**$0.4677**
Utility Program Cost per kW at Gen	**$514**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **COMMERCIAL AC CONTROL**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$24,274	$26,762	$29,874
Incentive Costs =	$6,112	$10,918	$11,010
16) Total Utility Project Costs =	$30,386	$37,680	$40,884
17) Direct Participant Costs ($/Part.) =	$63	$59	$59
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	10.0	10.0	10.0
21) Avg. Dth/Part. Saved =	7.70	7.70	7.70
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	83	150	150
24) Total Annual Dth Saved =	639	1,155	1,155
25) Incentive/Participant =	$73.63	$72.78	$73.40

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$366	$251	$273
Cost per Participant per Dth =	$56	$40.32	$43.07
Lifetime Energy Reduction (Dth)	29,491		
Societal Cost per Dth	$4.53		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($150,716)	0.46
Utility Cost Test	$21,534	1.20
Societal Test	$101,004	1.76
Participant Test	$171,538	8.47

SELF-DIRECT

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$0	$0	$0	$0
T & D	N/A	$0	$0	$0	$0
Marginal Energy	N/A	$0	$0	$0	$0
Environmental Externality	N/A	N/A	N/A	N/A	$0
Subtotal	N/A	$0	$0	$0	$0
Participant Benefits					
Bill Reduction - Electric	$0	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$0	N/A	N/A	$0	$0
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$0	N/A	N/A	$0	$0
Total Benefits	$0	$0	$0	$0	$0
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$5,000	$5,000	$5,000	$5,000
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$0	$0	$0	$0
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$5,000	$5,000	$5,000	$5,000
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$0	N/A	N/A
Subtotal	N/A	N/A	$0	N/A	N/A
Participant Costs					
Incremental Capital Costs	$0	N/A	N/A	$0	$0
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$0	N/A	N/A	$0	$0
Total Costs	$0	$5,000	$5,000	$5,000	$5,000
Net Benefit (Cost)	**$0**	**($5,000)**	**($5,000)**	**($5,000)**	**($5,000)**
Benefit/Cost Ratio	**INF**	**-**	**-**	**-**	**-**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	0.0 years
T & D Loss Factor (Energy)	0.00%
T & D Loss Factor (Demand)	0.00%
Net coincident kW Saved at Generator	#DIV/0!
Gross Annual kWh Saved at Customer	#DIV/0!
Net Annual kWh Saved at Generator	#DIV/0!

Program Summary All Participants	
Total Participants	**0**
Total Budget	**$5,000**
Net coincident kW Saved at Generator	**#DIV/0!**
Gross Annual kWh Saved at Customer	#DIV/0!
Net Annual kWh Saved at Generator	**#DIV/0!**

Utility Program Cost per kWh Lifetime	**#DIV/0!**
Utility Program Cost per kW at Gen	**#DIV/0!**

SELF-DIRECT

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$0	$0	$0	$0
T & D	N/A	$0	$0	$0	$0
Marginal Energy	N/A	$0	$0	$0	$0
Environmental Externality	N/A	N/A	N/A	N/A	$0
Subtotal	N/A	$0	$0	$0	$0
Participant Benefits					
Bill Reduction - Electric	$0	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$0	N/A	N/A	$0	$0
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$0	N/A	N/A	$0	$0
Total Benefits	$0	$0	$0	$0	$0
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$5,150	$5,150	$5,150	$5,150
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$0	$0	$0	$0
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$5,150	$5,150	$5,150	$5,150
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$0	N/A	N/A
Subtotal	N/A	N/A	$0	N/A	N/A
Participant Costs					
Incremental Capital Costs	$0	N/A	N/A	$0	$0
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$0	N/A	N/A	$0	$0
Total Costs	$0	$5,150	$5,150	$5,150	$5,150
Net Benefit (Cost)	**$0**	**($5,150)**	**($5,150)**	**($5,150)**	**($5,150)**
Benefit/Cost Ratio	**INF**	**-**	**-**	**-**	**-**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	0.0 years
T & D Loss Factor (Energy)	0.00%
T & D Loss Factor (Demand)	0.00%
Net coincident kW Saved at Generator	#DIV/0!
Gross Annual kWh Saved at Customer	#DIV/0!
Net Annual kWh Saved at Generator	#DIV/0!

Program Summary All Participants	
Total Participants	**0**
Total Budget	**$5,150**
Net coincident kW Saved at Generator	**#DIV/0!**
Gross Annual kWh Saved at Customer	#DIV/0!
Net Annual kWh Saved at Generator	**#DIV/0!**

Utility Program Cost per kWh Lifetime	**#DIV/0!**
Utility Program Cost per kW at Gen	**#DIV/0!**

SELF-DIRECT

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$0	$0	$0	$0
T & D	N/A	$0	$0	$0	$0
Marginal Energy	N/A	$0	$0	$0	$0
Environmental Externality	N/A	N/A	N/A	N/A	$0
Subtotal	N/A	$0	$0	$0	$0
Participant Benefits					
Bill Reduction - Electric	$0	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$0	N/A	N/A	$0	$0
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$0	N/A	N/A	$0	$0
Total Benefits	$0	$0	$0	$0	$0
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$5,304	$5,304	$5,304	$5,304
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$0	$0	$0	$0
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$5,304	$5,304	$5,304	$5,304
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$0	N/A	N/A
Subtotal	N/A	N/A	$0	N/A	N/A
Participant Costs					
Incremental Capital Costs	$0	N/A	N/A	$0	$0
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$0	N/A	N/A	$0	$0
Total Costs	$0	$5,304	$5,304	$5,304	$5,304
Net Benefit (Cost)	**$0**	**($5,304)**	**($5,304)**	**($5,304)**	**($5,304)**
Benefit/Cost Ratio	**INF**	**-**	**-**	**-**	**-**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	0.0 years
T & D Loss Factor (Energy)	0.00%
T & D Loss Factor (Demand)	0.00%
Net coincident kW Saved at Generator	#DIV/0!
Gross Annual kWh Saved at Customer	#DIV/0!
Net Annual kWh Saved at Generator	#DIV/0!

Program Summary All Participants	
Total Participants	**0**
Total Budget	**$5,304**
Net coincident kW Saved at Generator	**#DIV/0!**
Gross Annual kWh Saved at Customer	#DIV/0!
Net Annual kWh Saved at Generator	**#DIV/0!**

Utility Program Cost per kWh Lifetime	**#DIV/0!**
Utility Program Cost per kW at Gen	**#DIV/0!**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **SELF-DIRECT**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$1,870	$1,920	$1,980
Incentive Costs =	$0	$0	$0
16) Total Utility Project Costs =	$1,870	$1,920	$1,980
17) Direct Participant Costs ($/Part.) =	#DIV/0!	#DIV/0!	#DIV/0!
18) Participant Non-Energy Costs (Annual $/Part.) =	#DIV/0!	#DIV/0!	#DIV/0!
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	#DIV/0!	#DIV/0!	#DIV/0!
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	0.0	0.0	0.0
21) Avg. Dth/Part. Saved =	-	-	-
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	-	-	-
24) Total Annual Dth Saved =	0	0	0
25) Incentive/Participant =	$0.00	$0.00	$0.00

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	#DIV/0!	#DIV/0!	#DIV/0!
Cost per Participant per Dth =	#DIV/0!	#DIV/0!	#DIV/0!
Lifetime Energy Reduction (Dth)	0		
Societal Cost per Dth	#DIV/0!		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($5,770)	-
Utility Cost Test	($5,770)	-
Societal Test	($5,770)	-
Participant Test	$0	#DIV/0!

RESIDENTIAL SEGMENT EE AND DR TOTAL

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$39,341,697	$39,341,697	$39,341,697	$46,068,416
T & D	N/A	$4,939,227	$4,939,227	$4,939,227	$5,869,533
Marginal Energy	N/A	$57,407,803	$57,407,803	$57,407,803	$71,415,421
Environmental Externality	N/A	N/A	N/A	N/A	$10,245,233
Subtotal	N/A	$101,688,727	$101,688,727	$101,688,727	$133,598,604
Participant Benefits					
Bill Reduction - Electric	$368,577,554	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$11,899,199	N/A	N/A	$11,899,199	$11,899,199
Incremental Capital Savings	$320,890	N/A	N/A	$320,890	$299,713
Incremental O&M Savings	$4,009,900	N/A	N/A	$4,009,900	$4,529,646
Subtotal	$384,807,543	N/A	N/A	$16,229,989	$16,728,558
Total Benefits	$384,807,543	$101,688,727	$101,688,727	$117,918,716	$150,327,162
Costs					
Utility Project Costs					
Customer Services	N/A	$582,884	$582,884	$582,884	$582,884
Project Administration	N/A	$11,971,880	$11,971,880	$11,971,880	$11,971,880
Advertising & Promotion	N/A	$1,705,566	$1,705,566	$1,705,566	$1,705,566
Measurement & Verification	N/A	$180,000	$180,000	$180,000	$180,000
Rebates	N/A	$11,899,199	$11,899,199	$11,899,199	$11,899,199
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$26,339,530	$26,339,530	$26,339,530	$26,339,530
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$368,577,554	N/A	N/A
Subtotal	N/A	N/A	$368,577,554	N/A	N/A
Participant Costs					
Incremental Capital Costs	$21,044,409	N/A	N/A	$21,044,409	$20,539,526
Incremental O&M Costs	$2,053	N/A	N/A	$2,053	$2,319
Subtotal	$21,046,462	N/A	N/A	$21,046,462	$20,541,845
Total Costs	$21,046,462	$26,339,530	$394,917,083	$47,385,992	$46,881,374
Net Benefit (Cost)	**$363,761,080**	**$75,349,197**	**($293,228,357)**	**$70,532,724**	**$103,445,787**
Benefit/Cost Ratio	**18.28**	**3.86**	**0.26**	**2.49**	**3.21**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	14.3 years
T & D Loss Factor (Energy)	7.67%
T & D Loss Factor (Demand)	9.53%
Net coincident kW Saved at Generator	0.11 kW
Gross Annual kWh Saved at Customer	353 kWh
Net Annual kWh Saved at Generator	373 kWh

Program Summary All Participants	
Total Participants	**573,164**
Total Budget	**$26,339,530**
Net coincident kW Saved at Generator	**62,895 kW**
Gross Annual kWh Saved at Customer	202,381,764 kWh
Net Annual kWh Saved at Generator	**213,826,635 kWh**

Utility Program Cost per kWh Lifetime	**$0.0086**
Utility Program Cost per kW at Gen	**$419**

RESIDENTIAL SEGMENT EE AND DR TOTAL

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$40,201,941	$40,201,941	$40,201,941	$47,018,439
T & D	N/A	$5,047,842	$5,047,842	$5,047,842	$5,990,317
Marginal Energy	N/A	$60,082,700	$60,082,700	$60,082,700	$74,663,037
Environmental Externality	N/A	N/A	N/A	N/A	$13,581,751
Subtotal	N/A	$105,332,483	$105,332,483	$105,332,483	$141,253,544
Participant Benefits					
Bill Reduction - Electric	$374,355,362	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$11,998,334	N/A	N/A	$11,998,334	$11,998,334
Incremental Capital Savings	$337,147	N/A	N/A	$337,147	$321,470
Incremental O&M Savings	$4,252,269	N/A	N/A	$4,252,269	$4,803,430
Subtotal	$390,943,111	N/A	N/A	$16,587,750	$17,123,234
Total Benefits	$390,943,111	$105,332,483	$105,332,483	$121,920,233	$158,376,778
Costs					
Utility Project Costs					
Customer Services	N/A	$635,459	$635,459	$635,459	$635,459
Project Administration	N/A	$12,505,521	$12,505,521	$12,505,521	$12,505,521
Advertising & Promotion	N/A	$1,744,899	$1,744,899	$1,744,899	$1,744,899
Measurement & Verification	N/A	$181,500	$181,500	$181,500	$181,500
Rebates	N/A	$11,998,334	$11,998,334	$11,998,334	$11,998,334
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$27,065,713	$27,065,713	$27,065,713	$27,065,713
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$374,355,362	N/A	N/A
Subtotal	N/A	N/A	$374,355,362	N/A	N/A
Participant Costs					
Incremental Capital Costs	$21,224,940	N/A	N/A	$21,224,940	$20,734,471
Incremental O&M Costs	$2,053	N/A	N/A	$2,053	$2,319
Subtotal	$21,226,993	N/A	N/A	$21,226,993	$20,736,790
Total Costs	$21,226,993	$27,065,713	$401,421,075	$48,292,706	$47,802,503
Net Benefit (Cost)	**$369,716,118**	**$78,266,770**	**($296,088,592)**	**$73,627,526**	**$110,574,275**
Benefit/Cost Ratio	**18.42**	**3.89**	**0.26**	**2.52**	**3.31**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	14.2 years
T & D Loss Factor (Energy)	7.68%
T & D Loss Factor (Demand)	9.55%
Net coincident kW Saved at Generator	0.11 kW
Gross Annual kWh Saved at Customer	354 kWh
Net Annual kWh Saved at Generator	374 kWh

Program Summary All Participants	
Total Participants	**567,794**
Total Budget	**$27,065,713**
Net coincident kW Saved at Generator	**64,099 kW**
Gross Annual kWh Saved at Customer	201,180,061 kWh
Net Annual kWh Saved at Generator	**212,256,325 kWh**
Utility Program Cost per kWh Lifetime	**$0.0090**
Utility Program Cost per kW at Gen	**$422**

RESIDENTIAL SEGMENT EE AND DR TOTAL

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$40,564,357	$40,564,357	$40,564,357	$47,391,750
T & D	N/A	$5,063,303	$5,063,303	$5,063,303	$6,003,442
Marginal Energy	N/A	$63,111,337	$63,111,337	$63,111,337	$78,246,954
Environmental Externality	N/A	N/A	N/A	N/A	$10,888,774
Subtotal	N/A	$108,738,997	$108,738,997	$108,738,997	$142,530,921
Participant Benefits					
Bill Reduction - Electric	$378,089,114	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$11,804,893	N/A	N/A	$11,804,893	$11,804,893
Incremental Capital Savings	$358,006	N/A	N/A	$358,006	$324,897
Incremental O&M Savings	$4,505,688	N/A	N/A	$4,505,688	$5,089,695
Subtotal	$394,757,701	N/A	N/A	$16,668,587	$17,219,485
Total Benefits	$394,757,701	$108,738,997	$108,738,997	$125,407,583	$159,750,406
Costs					
Utility Project Costs					
Customer Services	N/A	$706,775	$706,775	$706,775	$706,775
Project Administration	N/A	$13,061,976	$13,061,976	$13,061,976	$13,061,976
Advertising & Promotion	N/A	$1,790,736	$1,790,736	$1,790,736	$1,790,736
Measurement & Verification	N/A	$183,000	$183,000	$183,000	$183,000
Rebates	N/A	$11,804,893	$11,804,893	$11,804,893	$11,804,893
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$27,547,380	$27,547,380	$27,547,380	$27,547,380
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$378,089,114	N/A	N/A
Subtotal	N/A	N/A	$378,089,114	N/A	N/A
Participant Costs					
Incremental Capital Costs	$20,023,500	N/A	N/A	$20,023,500	$19,521,549
Incremental O&M Costs	$2,395	N/A	N/A	$2,395	$2,706
Subtotal	$20,025,895	N/A	N/A	$20,025,895	$19,524,255
Total Costs	$20,025,895	$27,547,380	$405,636,494	$47,573,275	$47,071,635
Net Benefit (Cost)	**$374,731,806**	**$81,191,617**	**($296,897,497)**	**$77,834,309**	**$112,678,771**
Benefit/Cost Ratio	**19.71**	**3.95**	**0.27**	**2.64**	**3.39**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	14.2 years
T & D Loss Factor (Energy)	7.68%
T & D Loss Factor (Demand)	9.55%
Net coincident kW Saved at Generator	0.11 kW
Gross Annual kWh Saved at Customer	346 kWh
Net Annual kWh Saved at Generator	364 kWh

Program Summary All Participants	
Total Participants	**570,354**
Total Budget	**$27,547,380**
Net coincident kW Saved at Generator	**65,112 kW**
Gross Annual kWh Saved at Customer	197,226,213 kWh
Net Annual kWh Saved at Generator	**207,691,151 kWh**

Utility Program Cost per kWh Lifetime	**$0.0093**
Utility Program Cost per kW at Gen	**$423**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **Residential Segment EE and DR Total**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$2,413,758	$2,597,105	$2,794,050
Incentive Costs =	$4,473,162	$4,528,313	$4,633,797
16) Total Utility Project Costs =	$6,886,920	$7,125,418	$7,427,847
17) Direct Participant Costs ($/Part.) =	$68	$69	$70
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$100	$106	$114
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	13.3	13.1	13.0
21) Avg. Dth/Part. Saved =	1.69	1.76	1.84
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	238,792	239,784	237,860
24) Total Annual Dth Saved =	402,608	421,419	438,045
25) Incentive/Participant =	$18.73	$18.88	$19.48

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$29	$30	$31
Cost per Participant per Dth =	$57	$56.06	$55.10
Lifetime Energy Reduction (Dth)	16,568,310		
Societal Cost per Dth	$4.36		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($54,821,749)	0.57
Utility Cost Test	$50,143,990	3.34
Societal Test	$136,292,403	2.89
Participant Test	$145,416,950	3.94

EFFICIENT NEW HOMES CONSTRUCTION

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$1,452,235	$1,452,235	$1,452,235	$1,746,261
T & D	N/A	$259,798	$259,798	$259,798	$313,189
Marginal Energy	N/A	$1,548,753	$1,548,753	$1,548,753	$1,967,319
Environmental Externality	N/A	N/A	N/A	N/A	$284,059
Subtotal	N/A	$3,260,787	$3,260,787	$3,260,787	$4,310,828
Participant Benefits					
Bill Reduction - Electric	$9,814,643	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$577,090	N/A	N/A	$577,090	$577,090
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$41,856	N/A	N/A	$41,856	$47,281
Subtotal	$10,433,588	N/A	N/A	$618,946	$624,371
Total Benefits	$10,433,588	$3,260,787	$3,260,787	$3,879,732	$4,935,199
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$319,587	$319,587	$319,587	$319,587
Advertising & Promotion	N/A	$60,000	$60,000	$60,000	$60,000
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$577,090	$577,090	$577,090	$577,090
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$956,677	$956,677	$956,677	$956,677
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$9,814,643	N/A	N/A
Subtotal	N/A	N/A	$9,814,643	N/A	N/A
Participant Costs					
Incremental Capital Costs	$2,515,870	N/A	N/A	$2,515,870	$2,254,238
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$2,515,870	N/A	N/A	$2,515,870	$2,254,238
Total Costs	$2,515,870	$956,677	$10,771,320	$3,472,547	$3,210,915
Net Benefit (Cost)	**$7,917,719**	**$2,304,110**	**($7,510,533)**	**$407,186**	**$1,724,284**
Benefit/Cost Ratio	**4.15**	**3.41**	**0.30**	**1.12**	**1.54**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	19.5 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.32 kW
Gross Annual kWh Saved at Customer	686 kWh
Net Annual kWh Saved at Generator	745 kWh

Program Summary All Participants	
Total Participants	**5,585**
Total Budget	**$956,677**
Net coincident kW Saved at Generator	**1,760 kW**
Gross Annual kWh Saved at Customer	3,830,658 kWh
Net Annual kWh Saved at Generator	**4,161,950 kWh**

Utility Program Cost per kWh Lifetime	**$0.0118**
Utility Program Cost per kW at Gen	**$544**

EFFICIENT NEW HOMES CONSTRUCTION

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$1,532,955	$1,532,955	$1,532,955	$1,842,602
T & D	N/A	$275,197	$275,197	$275,197	$331,627
Marginal Energy	N/A	$1,714,910	$1,714,910	$1,714,910	$2,178,373
Environmental Externality	N/A	N/A	N/A	N/A	$346,724
Subtotal	N/A	$3,523,062	$3,523,062	$3,523,062	$4,699,327
Participant Benefits					
Bill Reduction - Electric	$10,587,690	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$620,067	N/A	N/A	$620,067	$620,067
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$41,856	N/A	N/A	$41,856	$47,281
Subtotal	$11,249,613	N/A	N/A	$661,923	$667,348
Total Benefits	$11,249,613	$3,523,062	$3,523,062	$4,184,985	$5,366,674
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$321,451	$321,451	$321,451	$321,451
Advertising & Promotion	N/A	$60,000	$60,000	$60,000	$60,000
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$620,067	$620,067	$620,067	$620,067
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,001,518	$1,001,518	$1,001,518	$1,001,518
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$10,587,690	N/A	N/A
Subtotal	N/A	N/A	$10,587,690	N/A	N/A
Participant Costs					
Incremental Capital Costs	$2,631,633	N/A	N/A	$2,631,633	$2,377,673
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$2,631,633	N/A	N/A	$2,631,633	$2,377,673
Total Costs	$2,631,633	$1,001,518	$11,589,208	$3,633,151	$3,379,191
Net Benefit (Cost)	**$8,617,980**	**$2,521,544**	**($8,066,146)**	**$551,834**	**$1,987,484**
Benefit/Cost Ratio	**4.27**	**3.52**	**0.30**	**1.15**	**1.59**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	19.5 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.32 kW
Gross Annual kWh Saved at Customer	694 kWh
Net Annual kWh Saved at Generator	754 kWh

Program Summary All Participants	
Total Participants	**5,759**
Total Budget	**$1,001,518**
Net coincident kW Saved at Generator	**1,828 kW**
Gross Annual kWh Saved at Customer	3,998,220 kWh
Net Annual kWh Saved at Generator	**4,344,002 kWh**

Utility Program Cost per kWh Lifetime	**$0.0118**
Utility Program Cost per kW at Gen	**$548**

EFFICIENT NEW HOMES CONSTRUCTION

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$1,610,677	$1,610,677	$1,610,677	$1,934,585
T & D	N/A	$290,114	$290,114	$290,114	$349,355
Marginal Energy	N/A	$1,895,125	$1,895,125	$1,895,125	$2,404,555
Environmental Externality	N/A	N/A	N/A	N/A	$309,361
Subtotal	N/A	$3,795,916	$3,795,916	$3,795,916	$4,997,856
Participant Benefits					
Bill Reduction - Electric	$11,322,331	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$644,422	N/A	N/A	$644,422	$644,422
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$41,856	N/A	N/A	$41,856	$47,281
Subtotal	$12,008,609	N/A	N/A	$686,278	$691,703
Total Benefits	$12,008,609	$3,795,916	$3,795,916	$4,482,194	$5,689,559
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$323,371	$323,371	$323,371	$323,371
Advertising & Promotion	N/A	$60,000	$60,000	$60,000	$60,000
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$644,422	$644,422	$644,422	$644,422
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,027,794	$1,027,794	$1,027,794	$1,027,794
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$11,322,331	N/A	N/A
Subtotal	N/A	N/A	$11,322,331	N/A	N/A
Participant Costs					
Incremental Capital Costs	$2,739,184	N/A	N/A	$2,739,184	$2,471,865
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$2,739,184	N/A	N/A	$2,739,184	$2,471,865
Total Costs	$2,739,184	$1,027,794	$12,350,125	$3,766,978	$3,499,659
Net Benefit (Cost)	**$9,269,425**	**$2,768,122**	**($8,554,209)**	**$715,216**	**$2,189,901**
Benefit/Cost Ratio	**4.38**	**3.69**	**0.31**	**1.19**	**1.63**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	19.5 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.32 kW
Gross Annual kWh Saved at Customer	691 kWh
Net Annual kWh Saved at Generator	751 kWh

Program Summary All Participants	
Total Participants	**6,001**
Total Budget	**$1,027,794**
Net coincident kW Saved at Generator	**1,896 kW**
Gross Annual kWh Saved at Customer	4,146,984 kWh
Net Annual kWh Saved at Generator	**4,505,632 kWh**

Utility Program Cost per kWh Lifetime	**$0.0117**
Utility Program Cost per kW at Gen	**$542**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **Efficient New Homes Construction**

Input Data	
1) Retail Rate ($/Dth) =	$6.06
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	3.02%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$700,239	$701,364	$702,522
Incentive Costs =	$864,650	$909,148	$962,942
16) Total Utility Project Costs =	$1,564,889	$1,610,512	$1,665,465
17) Direct Participant Costs ($/Part.) =	$1,315	$1,330	$1,314
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$28	$27	$26
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	19.4	19.3	19.2
21) Avg. Dth/Part. Saved =	13.37	13.60	13.61
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	3,390	3,494	3,628
24) Total Annual Dth Saved =	45,339	47,520	49,384
25) Incentive/Participant =	$255.06	$260.20	$265.42

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$462	$461	$459
Cost per Participant per Dth =	$133	$131.65	$130.26
Lifetime Energy Reduction (Dth)	2,747,353		
Societal Cost per Dth	$7.10		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($10,377,800)	0.53
Utility Cost Test	$6,883,942	2.42
Societal Test	$3,592,132	1.18
Participant Test	$6,411,285	1.46

ENERGY EFFICIENT SHOWERHEAD

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$34,939	$34,939	$34,939	$38,535
T & D	N/A	$6,172	$6,172	$6,172	$6,811
Marginal Energy	N/A	$164,448	$164,448	$164,448	$184,275
Environmental Externality	N/A	N/A	N/A	N/A	$28,912
Subtotal	N/A	$205,559	$205,559	$205,559	$258,533
Participant Benefits					
Bill Reduction - Electric	$975,873	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$10,638	N/A	N/A	$10,638	$10,638
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$1,230,430	N/A	N/A	$1,230,430	$1,389,913
Subtotal	$2,216,941	N/A	N/A	$1,241,068	$1,400,551
Total Benefits	$2,216,941	$205,559	$205,559	$1,446,627	$1,659,085
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$22,878	$22,878	$22,878	$22,878
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$10,638	$10,638	$10,638	$10,638
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$33,516	$33,516	$33,516	$33,516
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$975,873	N/A	N/A
Subtotal	N/A	N/A	$975,873	N/A	N/A
Participant Costs					
Incremental Capital Costs	$10,818	N/A	N/A	$10,818	$10,818
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$10,818	N/A	N/A	$10,818	$10,818
Total Costs	$10,818	$33,516	$1,009,389	$44,334	$44,334
Net Benefit (Cost)	**$2,206,123**	**$172,043**	**($803,830)**	**$1,402,293**	**$1,614,751**
Benefit/Cost Ratio	**204.93**	**6.13**	**0.20**	**32.63**	**37.42**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	10.0 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.01 kW
Gross Annual kWh Saved at Customer	212 kWh
Net Annual kWh Saved at Generator	139 kWh

Program Summary All Participants	
Total Participants	**5,840**
Total Budget	**$33,516**
Net coincident kW Saved at Generator	**66 kW**
Gross Annual kWh Saved at Customer	1,239,150 kWh
Net Annual kWh Saved at Generator	**810,168 kWh**

Utility Program Cost per kWh Lifetime	**$0.0041**
Utility Program Cost per kW at Gen	**$506**

ENERGY EFFICIENT SHOWERHEAD

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$35,638	$35,638	$35,638	$39,306
T & D	N/A	$6,317	$6,317	$6,317	$6,972
Marginal Energy	N/A	$173,163	$173,163	$173,163	$193,783
Environmental Externality	N/A	N/A	N/A	N/A	$36,690
Subtotal	N/A	$215,119	$215,119	$215,119	$276,750
Participant Benefits					
Bill Reduction - Electric	$999,906	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$10,638	N/A	N/A	$10,638	$10,638
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$1,230,430	N/A	N/A	$1,230,430	$1,389,913
Subtotal	$2,240,975	N/A	N/A	$1,241,068	$1,400,551
Total Benefits	$2,240,975	$215,119	$215,119	$1,456,187	$1,677,301
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$23,987	$23,987	$23,987	$23,987
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$10,638	$10,638	$10,638	$10,638
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$34,625	$34,625	$34,625	$34,625
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$999,906	N/A	N/A
Subtotal	N/A	N/A	$999,906	N/A	N/A
Participant Costs					
Incremental Capital Costs	$10,818	N/A	N/A	$10,818	$10,818
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$10,818	N/A	N/A	$10,818	$10,818
Total Costs	$10,818	$34,625	$1,034,531	$45,443	$45,443
Net Benefit (Cost)	**$2,230,157**	**$180,494**	**($819,412)**	**$1,410,744**	**$1,631,859**
Benefit/Cost Ratio	**207.15**	**6.21**	**0.21**	**32.04**	**36.91**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	10.0 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.01 kW
Gross Annual kWh Saved at Customer	212 kWh
Net Annual kWh Saved at Generator	139 kWh

Program Summary All Participants	
Total Participants	**5,840**
Total Budget	**$34,625**
Net coincident kW Saved at Generator	**66 kW**
Gross Annual kWh Saved at Customer	1,239,150 kWh
Net Annual kWh Saved at Generator	**810,168 kWh**

Utility Program Cost per kWh Lifetime	**$0.0043**
Utility Program Cost per kW at Gen	**$523**

ENERGY EFFICIENT SHOWERHEAD

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$36,351	$36,351	$36,351	$40,092
T & D	N/A	$6,466	$6,466	$6,466	$7,137
Marginal Energy	N/A	$183,160	$183,160	$183,160	$204,262
Environmental Externality	N/A	N/A	N/A	N/A	$25,560
Subtotal	N/A	$225,977	$225,977	$225,977	$277,051
Participant Benefits					
Bill Reduction - Electric	$1,026,061	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$10,638	N/A	N/A	$10,638	$10,638
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$1,230,430	N/A	N/A	$1,230,430	$1,389,913
Subtotal	$2,267,129	N/A	N/A	$1,241,068	$1,400,551
Total Benefits	$2,267,129	$225,977	$225,977	$1,467,046	$1,677,602
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$25,098	$25,098	$25,098	$25,098
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$10,638	$10,638	$10,638	$10,638
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$35,736	$35,736	$35,736	$35,736
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$1,026,061	N/A	N/A
Subtotal	N/A	N/A	$1,026,061	N/A	N/A
Participant Costs					
Incremental Capital Costs	$10,818	N/A	N/A	$10,818	$10,818
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$10,818	N/A	N/A	$10,818	$10,818
Total Costs	$10,818	$35,736	$1,061,797	$46,554	$46,554
Net Benefit (Cost)	**$2,256,312**	**$190,241**	**($835,820)**	**$1,420,492**	**$1,631,048**
Benefit/Cost Ratio	**209.57**	**6.32**	**0.21**	**31.51**	**36.04**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	10.0 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.01 kW
Gross Annual kWh Saved at Customer	212 kWh
Net Annual kWh Saved at Generator	139 kWh

Program Summary All Participants	
Total Participants	**5,840**
Total Budget	**$35,736**
Net coincident kW Saved at Generator	**66 kW**
Gross Annual kWh Saved at Customer	1,239,150 kWh
Net Annual kWh Saved at Generator	**810,168 kWh**

Utility Program Cost per kWh Lifetime	**$0.0044**
Utility Program Cost per kW at Gen	**$540**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **ENERGY EFFICIENT SHOWERHEAD**

Input Data	
1) Retail Rate ($/Dth) =	$6.06
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	3.02%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$169,499	$177,528	$185,691
Incentive Costs =	$90,086	$90,086	$90,086
16) Total Utility Project Costs =	$259,585	$267,614	$275,777
17) Direct Participant Costs ($/Part.) =	$2	$2	$2
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$237	$237	$237
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	10.0	10.0	10.0
21) Avg. Dth/Part. Saved =	0.54	0.54	0.54
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	49,400	49,400	49,400
24) Total Annual Dth Saved =	26,781	26,781	26,781
25) Incentive/Participant =	$1.82	$1.82	$1.82

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$5	$5	$6
Cost per Participant per Dth =	$13	$13.41	$13.71
Lifetime Energy Reduction (Dth)	803,424		
Societal Cost per Dth	$1.34		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($2,468,433)	0.59
Utility Cost Test	$2,723,734	4.39
Societal Test	$39,897,069	38.04
Participant Test	$40,303,182	147.93

HOME ENERGY INSIGHTS

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$754,146	$754,146	$754,146	$754,146
T & D	N/A	$131,214	$131,214	$131,214	$131,214
Marginal Energy	N/A	$1,303,120	$1,303,120	$1,303,120	$1,303,120
Environmental Externality	N/A	N/A	N/A	N/A	($295,798)
Subtotal	N/A	$2,188,480	$2,188,480	$2,188,480	$1,892,682
Participant Benefits					
Bill Reduction - Electric	$7,036,595	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$0	N/A	N/A	$0	$0
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$7,036,595	N/A	N/A	$0	$0
Total Benefits	$7,036,595	$2,188,480	$2,188,480	$2,188,480	$1,892,682
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$1,428,667	$1,428,667	$1,428,667	$1,428,667
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$0	$0	$0	$0
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,428,667	$1,428,667	$1,428,667	$1,428,667
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$7,036,595	N/A	N/A
Subtotal	N/A	N/A	$7,036,595	N/A	N/A
Participant Costs					
Incremental Capital Costs	$0	N/A	N/A	$0	$0
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$0	N/A	N/A	$0	$0
Total Costs	$0	$1,428,667	$8,465,262	$1,428,667	$1,428,667
Net Benefit (Cost)	**$7,036,595**	**$759,813**	**($6,276,782)**	**$759,813**	**$464,016**
Benefit/Cost Ratio	**INF**	**1.53**	**0.26**	**1.53**	**1.32**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	2.7 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.02 kW
Gross Annual kWh Saved at Customer	79 kWh
Net Annual kWh Saved at Generator	86 kWh

Program Summary All Participants	
Total Participants	**232,000**
Total Budget	**$1,428,667**
Net coincident kW Saved at Generator	**4,409 kW**
Gross Annual kWh Saved at Customer	18,361,975 kWh
Net Annual kWh Saved at Generator	**19,949,994 kWh**

Utility Program Cost per kWh Lifetime	**$0.0266**
Utility Program Cost per kW at Gen	**$324**

HOME ENERGY INSIGHTS

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$919,101	$919,101	$919,101	$919,101
T & D	N/A	$160,486	$160,486	$160,486	$160,486
Marginal Energy	N/A	$1,424,479	$1,424,479	$1,424,479	$1,424,479
Environmental Externality	N/A	N/A	N/A	N/A	$992,565
Subtotal	N/A	$2,504,067	$2,504,067	$2,504,067	$3,496,631
Participant Benefits					
Bill Reduction - Electric	$7,889,243	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$0	N/A	N/A	$0	$0
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$7,889,243	N/A	N/A	$0	$0
Total Benefits	$7,889,243	$2,504,067	$2,504,067	$2,504,067	$3,496,631
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$1,429,827	$1,429,827	$1,429,827	$1,429,827
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$0	$0	$0	$0
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,429,827	$1,429,827	$1,429,827	$1,429,827
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$7,889,243	N/A	N/A
Subtotal	N/A	N/A	$7,889,243	N/A	N/A
Participant Costs					
Incremental Capital Costs	$0	N/A	N/A	$0	$0
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$0	N/A	N/A	$0	$0
Total Costs	$0	$1,429,827	$9,319,069	$1,429,827	$1,429,827
Net Benefit (Cost)	**$7,889,243**	**$1,074,240**	**($6,815,003)**	**$1,074,240**	**$2,066,805**
Benefit/Cost Ratio	**INF**	**1.75**	**0.27**	**1.75**	**2.45**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	2.7 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.02 kW
Gross Annual kWh Saved at Customer	87 kWh
Net Annual kWh Saved at Generator	94 kWh

Program Summary All Participants	
Total Participants	**230,000**
Total Budget	**$1,429,827**
Net coincident kW Saved at Generator	**5,492 kW**
Gross Annual kWh Saved at Customer	19,920,859 kWh
Net Annual kWh Saved at Generator	**21,643,697 kWh**

Utility Program Cost per kWh Lifetime	**$0.0243**
Utility Program Cost per kW at Gen	**$260**

HOME ENERGY INSIGHTS

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$138,757	$138,757	$138,757	$138,757
T & D	N/A	$24,322	$24,322	$24,322	$24,322
Marginal Energy	N/A	$84,623	$84,623	$84,623	$84,623
Environmental Externality	N/A	N/A	N/A	N/A	$46,735
Subtotal	N/A	$247,703	$247,703	$247,703	$294,438
Participant Benefits					
Bill Reduction - Electric	$535,222	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$0	N/A	N/A	$0	$0
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$535,222	N/A	N/A	$0	$0
Total Benefits	$535,222	$247,703	$247,703	$247,703	$294,438
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$1,431,021	$1,431,021	$1,431,021	$1,431,021
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$0	$0	$0	$0
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,431,021	$1,431,021	$1,431,021	$1,431,021
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$535,222	N/A	N/A
Subtotal	N/A	N/A	$535,222	N/A	N/A
Participant Costs					
Incremental Capital Costs	$0	N/A	N/A	$0	$0
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$0	N/A	N/A	$0	$0
Total Costs	$0	$1,431,021	$1,966,243	$1,431,021	$1,431,021
Net Benefit (Cost)	**$535,222**	**($1,183,319)**	**($1,718,541)**	**($1,183,319)**	**($1,136,583)**
Benefit/Cost Ratio	**INF**	**0.17**	**0.13**	**0.17**	**0.21**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	2.7 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.03 kW
Gross Annual kWh Saved at Customer	82 kWh
Net Annual kWh Saved at Generator	89 kWh

Program Summary All Participants	
Total Participants	**235,000**
Total Budget	**$1,431,021**
Net coincident kW Saved at Generator	**6,984 kW**
Gross Annual kWh Saved at Customer	19,355,027 kWh
Net Annual kWh Saved at Generator	**21,028,930 kWh**

Utility Program Cost per kWh Lifetime	**$0.0251**
Utility Program Cost per kW at Gen	**$205**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **HOME ENERGY INSIGHTS**

Input Data	
1) Retail Rate ($/Dth) =	$6.06
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	3.02%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 First Year	2022 Second Year	2023 Third Year
Administrative & Operating Costs =	$170,293	$170,602	$170,920
Incentive Costs =	$0	$0	$0
16) Total Utility Project Costs =	$170,293	$170,602	$170,920
17) Direct Participant Costs ($/Part.) =	$0	$0	$0
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	2.0	2.1	2.1
21) Avg. Dth/Part. Saved =	0.33	0.35	0.37
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	131,000	129,000	124,000
24) Total Annual Dth Saved =	43,372	45,678	45,678
25) Incentive/Participant =	$0.00	$0.00	$0.00

Cost Summary	1st Yr	2nd Yr	3rd Yr
Utility Cost per Participant =	$1	$1	$1
Cost per Participant per Dth =	$4	$3.73	$3.74
Lifetime Energy Reduction (Dth)	276,727		
Societal Cost per Dth	$1.85		

Test Results	Triennial NPV	Triennial B/C
Ratepayer Impact Measure Test	($678,820)	0.65
Utility Cost Test	$738,438	2.44
Societal Test	$1,338,360	3.61
Participant Test	$1,417,258	#DIV/0!

HOME ENERGY SQUAD

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$1,224,046	$1,224,046	$1,224,046	$1,426,798
T & D	N/A	$183,572	$183,572	$183,572	$218,582
Marginal Energy	N/A	$2,622,873	$2,622,873	$2,622,873	$3,290,646
Environmental Externality	N/A	N/A	N/A	N/A	$494,426
Subtotal	N/A	$4,030,491	$4,030,491	$4,030,491	$5,430,452
Participant Benefits					
Bill Reduction - Electric	$17,171,451	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$710,213	N/A	N/A	$710,213	$710,213
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$792,611	N/A	N/A	$792,611	$895,346
Subtotal	$18,674,275	N/A	N/A	$1,502,825	$1,605,559
Total Benefits	$18,674,275	$4,030,491	$4,030,491	$5,533,316	$7,036,011
Costs					
Utility Project Costs					
Customer Services	N/A	$571,734	$571,734	$571,734	$571,734
Project Administration	N/A	$435,077	$435,077	$435,077	$435,077
Advertising & Promotion	N/A	$299,266	$299,266	$299,266	$299,266
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$710,213	$710,213	$710,213	$710,213
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$2,016,290	$2,016,290	$2,016,290	$2,016,290
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$17,171,451	N/A	N/A
Subtotal	N/A	N/A	$17,171,451	N/A	N/A
Participant Costs					
Incremental Capital Costs	$696,998	N/A	N/A	$696,998	$691,474
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$696,998	N/A	N/A	$696,998	$691,474
Total Costs	$696,998	$2,016,290	$19,187,741	$2,713,288	$2,707,764
Net Benefit (Cost)	**$17,977,277**	**$2,014,201**	**($15,157,249)**	**$2,820,028**	**$4,328,248**
Benefit/Cost Ratio	**26.79**	**2.00**	**0.21**	**2.04**	**2.60**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	18.2 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.25 kW
Gross Annual kWh Saved at Customer	884 kWh
Net Annual kWh Saved at Generator	960 kWh

Program Summary All Participants	
Total Participants	**8,133**
Total Budget	**$2,016,290**
Net coincident kW Saved at Generator	**2,016 kW**
Gross Annual kWh Saved at Customer	7,186,183 kWh
Net Annual kWh Saved at Generator	**7,807,673 kWh**
Utility Program Cost per kWh Lifetime	**$0.0142**
Utility Program Cost per kW at Gen	**$1,000**

HOME ENERGY SQUAD

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$1,481,469	$1,481,469	$1,481,469	$1,719,064
T & D	N/A	$214,952	$214,952	$214,952	$255,646
Marginal Energy	N/A	$3,138,861	$3,138,861	$3,138,861	$3,935,497
Environmental Externality	N/A	N/A	N/A	N/A	$658,363
Subtotal	N/A	$4,835,282	$4,835,282	$4,835,282	$6,568,569
Participant Benefits					
Bill Reduction - Electric	$19,980,044	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$821,582	N/A	N/A	$821,582	$821,582
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$892,668	N/A	N/A	$892,668	$1,008,371
Subtotal	$21,694,293	N/A	N/A	$1,714,249	$1,829,953
Total Benefits	$21,694,293	$4,835,282	$4,835,282	$6,549,531	$8,398,522
Costs					
Utility Project Costs					
Customer Services	N/A	$620,609	$620,609	$620,609	$620,609
Project Administration	N/A	$497,830	$497,830	$497,830	$497,830
Advertising & Promotion	N/A	$332,299	$332,299	$332,299	$332,299
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$821,582	$821,582	$821,582	$821,582
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$2,272,320	$2,272,320	$2,272,320	$2,272,320
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$19,980,044	N/A	N/A
Subtotal	N/A	N/A	$19,980,044	N/A	N/A
Participant Costs					
Incremental Capital Costs	$806,748	N/A	N/A	$806,748	$800,168
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$806,748	N/A	N/A	$806,748	$800,168
Total Costs	$806,748	$2,272,320	$22,252,364	$3,079,068	$3,072,488
Net Benefit (Cost)	**$20,887,546**	**$2,562,962**	**($17,417,083)**	**$3,470,463**	**$5,326,034**
Benefit/Cost Ratio	**26.89**	**2.13**	**0.22**	**2.13**	**2.73**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	18.1 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.27 kW
Gross Annual kWh Saved at Customer	887 kWh
Net Annual kWh Saved at Generator	964 kWh

Program Summary All Participants	
Total Participants	**9,149**
Total Budget	**$2,272,320**
Net coincident kW Saved at Generator	**2,497 kW**
Gross Annual kWh Saved at Customer	8,116,664 kWh
Net Annual kWh Saved at Generator	**8,818,627 kWh**

Utility Program Cost per kWh Lifetime	**$0.0142**
Utility Program Cost per kW at Gen	**$910**

HOME ENERGY SQUAD

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$1,753,008	$1,753,008	$1,753,008	$2,027,584
T & D	N/A	$245,481	$245,481	$245,481	$292,130
Marginal Energy	N/A	$3,765,196	$3,765,196	$3,765,196	$4,714,385
Environmental Externality	N/A	N/A	N/A	N/A	$629,174
Subtotal	N/A	$5,763,685	$5,763,685	$5,763,685	$7,663,273
Participant Benefits					
Bill Reduction - Electric	$23,207,163	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$934,239	N/A	N/A	$934,239	$934,239
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$1,003,772	N/A	N/A	$1,003,772	$1,133,877
Subtotal	$25,145,174	N/A	N/A	$1,938,012	$2,068,116
Total Benefits	$25,145,174	$5,763,685	$5,763,685	$7,701,696	$9,731,390
Costs					
Utility Project Costs					
Customer Services	N/A	$688,225	$688,225	$688,225	$688,225
Project Administration	N/A	$571,683	$571,683	$571,683	$571,683
Advertising & Promotion	N/A	$368,836	$368,836	$368,836	$368,836
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$934,239	$934,239	$934,239	$934,239
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$2,562,983	$2,562,983	$2,562,983	$2,562,983
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$23,207,163	N/A	N/A
Subtotal	N/A	N/A	$23,207,163	N/A	N/A
Participant Costs					
Incremental Capital Costs	$922,863	N/A	N/A	$922,863	$916,342
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$922,863	N/A	N/A	$922,863	$916,342
Total Costs	$922,863	$2,562,983	$25,770,146	$3,485,846	$3,479,325
Net Benefit (Cost)	**$24,222,311**	**$3,200,702**	**($20,006,461)**	**$4,215,850**	**$6,252,065**
Benefit/Cost Ratio	**27.25**	**2.25**	**0.22**	**2.21**	**2.80**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	18.1 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.29 kW
Gross Annual kWh Saved at Customer	886 kWh
Net Annual kWh Saved at Generator	963 kWh

Program Summary All Participants	
Total Participants	**10,293**
Total Budget	**$2,562,983**
Net coincident kW Saved at Generator	**3,003 kW**
Gross Annual kWh Saved at Customer	9,123,195 kWh
Net Annual kWh Saved at Generator	**9,912,207 kWh**
Utility Program Cost per kWh Lifetime	**$0.0143**
Utility Program Cost per kW at Gen	**$853**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **Home Energy Squad**

Input Data	
1) Retail Rate ($/Dth) =	$6.06
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	3.02%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$621,282	$691,341	$767,165
Incentive Costs =	$53,658	$64,283	$78,535
16) Total Utility Project Costs =	$674,940	$755,624	$845,700
17) Direct Participant Costs ($/Part.) =	$24	$26	$28
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$1,200	$1,200	$1,200
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	10.0	10.0	10.0
21) Avg. Dth/Part. Saved =	6.18	6.29	6.39
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	2,988	3,362	3,782
24) Total Annual Dth Saved =	18,458	21,136	24,184
25) Incentive/Participant =	$17.96	$19.12	$20.77

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$226	$225	$224
Cost per Participant per Dth =	$40	$39.85	$39.34
Lifetime Energy Reduction (Dth)	636,209		
Societal Cost per Dth	$4.02		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($3,600,602)	0.44
Utility Cost Test	$528,106	1.23
Societal Test	$14,243,748	6.57
Participant Test	$16,222,799	62.38

HOME LIGHTING

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$15,656,841	$15,656,841	$15,656,841	$18,764,580
T & D	N/A	$2,799,270	$2,799,270	$2,799,270	$3,364,081
Marginal Energy	N/A	$46,500,081	$46,500,081	$46,500,081	$58,329,313
Environmental Externality	N/A	N/A	N/A	N/A	$8,807,027
Subtotal	N/A	$64,956,192	$64,956,192	$64,956,192	$89,265,001
Participant Benefits					
Bill Reduction - Electric	$298,250,199	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$4,577,559	N/A	N/A	$4,577,559	$4,577,559
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$302,827,758	N/A	N/A	$4,577,559	$4,577,559
Total Benefits	$302,827,758	$64,956,192	$64,956,192	$69,533,751	$93,842,560
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$562,258	$562,258	$562,258	$562,258
Advertising & Promotion	N/A	$625,000	$625,000	$625,000	$625,000
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$4,577,559	$4,577,559	$4,577,559	$4,577,559
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$5,764,817	$5,764,817	$5,764,817	$5,764,817
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$298,250,199	N/A	N/A
Subtotal	N/A	N/A	$298,250,199	N/A	N/A
Participant Costs					
Incremental Capital Costs	$6,552,258	N/A	N/A	$6,552,258	$6,552,258
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$6,552,258	N/A	N/A	$6,552,258	$6,552,258
Total Costs	$6,552,258	$5,764,817	$304,015,016	$12,317,075	$12,317,075
Net Benefit (Cost)	**$296,275,500**	**$59,191,375**	**($239,058,824)**	**$57,216,677**	**$81,525,485**
Benefit/Cost Ratio	**46.22**	**11.27**	**0.21**	**5.65**	**7.62**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant

Lifetime (Weighted on Generator kWh)	15.7 years
T & D Loss Factor (Energy)	7.58%
T & D Loss Factor (Demand)	9.26%
Net coincident kW Saved at Generator	0.10 kW
Gross Annual kWh Saved at Customer	650 kWh
Net Annual kWh Saved at Generator	698 kWh

Program Summary All Participants

Total Participants	**231,508**
Total Budget	**$5,764,817**
Net coincident kW Saved at Generator	**22,180 kW**
Gross Annual kWh Saved at Customer	150,402,791 kWh
Net Annual kWh Saved at Generator	**161,583,086 kWh**
Utility Program Cost per kWh Lifetime	**$0.0023**
Utility Program Cost per kW at Gen	**$260**

HOME LIGHTING

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$15,492,834	$15,492,834	$15,492,834	$18,564,170
T & D	N/A	$2,779,828	$2,779,828	$2,779,828	$3,340,052
Marginal Energy	N/A	$47,981,140	$47,981,140	$47,981,140	$60,140,535
Environmental Externality	N/A	N/A	N/A	N/A	$10,413,657
Subtotal	N/A	$66,253,801	$66,253,801	$66,253,801	$92,458,415
Participant Benefits					
Bill Reduction - Electric	$298,321,738	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$4,443,277	N/A	N/A	$4,443,277	$4,443,277
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$302,765,015	N/A	N/A	$4,443,277	$4,443,277
Total Benefits	$302,765,015	$66,253,801	$66,253,801	$70,697,078	$96,901,692
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$566,354	$566,354	$566,354	$566,354
Advertising & Promotion	N/A	$625,000	$625,000	$625,000	$625,000
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$4,443,277	$4,443,277	$4,443,277	$4,443,277
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$5,634,631	$5,634,631	$5,634,631	$5,634,631
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$298,321,738	N/A	N/A
Subtotal	N/A	N/A	$298,321,738	N/A	N/A
Participant Costs					
Incremental Capital Costs	$6,446,509	N/A	N/A	$6,446,509	$6,446,509
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$6,446,509	N/A	N/A	$6,446,509	$6,446,509
Total Costs	$6,446,509	$5,634,631	$303,956,369	$12,081,140	$12,081,140
Net Benefit (Cost)	**$296,318,506**	**$60,619,170**	**($237,702,568)**	**$58,615,939**	**$84,820,552**
Benefit/Cost Ratio	**46.97**	**11.76**	**0.22**	**5.85**	**8.02**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.6 years
T & D Loss Factor (Energy)	7.58%
T & D Loss Factor (Demand)	9.26%
Net coincident kW Saved at Generator	0.10 kW
Gross Annual kWh Saved at Customer	650 kWh
Net Annual kWh Saved at Generator	699 kWh

Program Summary All Participants	
Total Participants	**224,476**
Total Budget	**$5,634,631**
Net coincident kW Saved at Generator	**21,534 kW**
Gross Annual kWh Saved at Customer	145,976,903 kWh
Net Annual kWh Saved at Generator	**156,826,897 kWh**

Utility Program Cost per kWh Lifetime	**$0.0023**
Utility Program Cost per kW at Gen	**$262**

HOME LIGHTING

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$15,349,943	$15,349,943	$15,349,943	$18,387,541
T & D	N/A	$2,763,988	$2,763,988	$2,763,988	$3,320,083
Marginal Energy	N/A	$49,932,888	$49,932,888	$49,932,888	$62,443,951
Environmental Externality	N/A	N/A	N/A	N/A	$8,436,237
Subtotal	N/A	$68,046,820	$68,046,820	$68,046,820	$92,587,811
Participant Benefits					
Bill Reduction - Electric	$298,916,456	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$4,323,136	N/A	N/A	$4,323,136	$4,323,136
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$303,239,592	N/A	N/A	$4,323,136	$4,323,136
Total Benefits	$303,239,592	$68,046,820	$68,046,820	$72,369,956	$96,910,947
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$570,858	$570,858	$570,858	$570,858
Advertising & Promotion	N/A	$625,000	$625,000	$625,000	$625,000
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$4,323,136	$4,323,136	$4,323,136	$4,323,136
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$5,518,994	$5,518,994	$5,518,994	$5,518,994
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$298,916,456	N/A	N/A
Subtotal	N/A	N/A	$298,916,456	N/A	N/A
Participant Costs					
Incremental Capital Costs	$6,387,961	N/A	N/A	$6,387,961	$6,387,961
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$6,387,961	N/A	N/A	$6,387,961	$6,387,961
Total Costs	$6,387,961	$5,518,994	$304,435,450	$11,906,955	$11,906,955
Net Benefit (Cost)	**$296,851,631**	**$62,527,826**	**($236,388,630)**	**$60,463,001**	**$85,003,992**
Benefit/Cost Ratio	**47.47**	**12.33**	**0.22**	**6.08**	**8.14**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.6 years
T & D Loss Factor (Energy)	7.57%
T & D Loss Factor (Demand)	9.25%
Net coincident kW Saved at Generator	0.10 kW
Gross Annual kWh Saved at Customer	650 kWh
Net Annual kWh Saved at Generator	699 kWh

Program Summary All Participants	
Total Participants	**218,166**
Total Budget	**$5,518,994**
Net coincident kW Saved at Generator	**20,942 kW**
Gross Annual kWh Saved at Customer	141,898,225 kWh
Net Annual kWh Saved at Generator	**152,443,243 kWh**

Utility Program Cost per kWh Lifetime	**$0.0023**
Utility Program Cost per kW at Gen	**$264**

INSULATION REBATE PROGRAM

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$166,397	$166,397	$166,397	$193,615
T & D	N/A	$28,390	$28,390	$28,390	$33,255
Marginal Energy	N/A	$71,876	$71,876	$71,876	$87,880
Environmental Externality	N/A	N/A	N/A	N/A	$11,834
Subtotal	N/A	$266,663	$266,663	$266,663	$326,584
Participant Benefits					
Bill Reduction - Electric	$412,595	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$41,746	N/A	N/A	$41,746	$41,746
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$454,342	N/A	N/A	$41,746	$41,746
Total Benefits	$454,342	$266,663	$266,663	$308,409	$368,330
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$41,269	$41,269	$41,269	$41,269
Advertising & Promotion	N/A	$5,000	$5,000	$5,000	$5,000
Measurement & Verification	N/A	$2,000	$2,000	$2,000	$2,000
Rebates	N/A	$41,746	$41,746	$41,746	$41,746
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$90,015	$90,015	$90,015	$90,015
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$412,595	N/A	N/A
Subtotal	N/A	N/A	$412,595	N/A	N/A
Participant Costs					
Incremental Capital Costs	$363,623	N/A	N/A	$363,623	$285,744
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$363,623	N/A	N/A	$363,623	$285,744
Total Costs	$363,623	$90,015	$502,611	$453,638	$375,760
Net Benefit (Cost)	**$90,719**	**$176,648**	**($235,948)**	**($145,229)**	**($7,430)**
Benefit/Cost Ratio	**1.25**	**2.96**	**0.53**	**0.68**	**0.98**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.2 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.19 kW
Gross Annual kWh Saved at Customer	147 kWh
Net Annual kWh Saved at Generator	160 kWh

Program Summary All Participants	
Total Participants	**1,381**
Total Budget	**$90,015**
Net coincident kW Saved at Generator	**256 kW**
Gross Annual kWh Saved at Customer	203,685 kWh
Net Annual kWh Saved at Generator	**221,301 kWh**

Utility Program Cost per kWh Lifetime	**$0.0268**
Utility Program Cost per kW at Gen	**$352**

INSULATION REBATE PROGRAM

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$169,725	$169,725	$169,725	$197,487
T & D	N/A	$29,061	$29,061	$29,061	$34,041
Marginal Energy	N/A	$76,250	$76,250	$76,250	$93,193
Environmental Externality	N/A	N/A	N/A	N/A	$14,201
Subtotal	N/A	$275,036	$275,036	$275,036	$338,921
Participant Benefits					
Bill Reduction - Electric	$425,059	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$42,482	N/A	N/A	$42,482	$42,482
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$467,541	N/A	N/A	$42,482	$42,482
Total Benefits	$467,541	$275,036	$275,036	$317,518	$381,403
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$42,064	$42,064	$42,064	$42,064
Advertising & Promotion	N/A	$5,000	$5,000	$5,000	$5,000
Measurement & Verification	N/A	$2,000	$2,000	$2,000	$2,000
Rebates	N/A	$42,482	$42,482	$42,482	$42,482
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$91,546	$91,546	$91,546	$91,546
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$425,059	N/A	N/A
Subtotal	N/A	N/A	$425,059	N/A	N/A
Participant Costs					
Incremental Capital Costs	$358,646	N/A	N/A	$358,646	$283,994
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$358,646	N/A	N/A	$358,646	$283,994
Total Costs	$358,646	$91,546	$516,605	$450,193	$375,540
Net Benefit (Cost)	**$108,895**	**$183,489**	**($241,570)**	**($132,675)**	**$5,863**
Benefit/Cost Ratio	**1.30**	**3.00**	**0.53**	**0.71**	**1.02**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.2 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.19 kW
Gross Annual kWh Saved at Customer	147 kWh
Net Annual kWh Saved at Generator	160 kWh

Program Summary All Participants	
Total Participants	**1,381**
Total Budget	**$91,546**
Net coincident kW Saved at Generator	**256 kW**
Gross Annual kWh Saved at Customer	203,685 kWh
Net Annual kWh Saved at Generator	**221,301 kWh**

Utility Program Cost per kWh Lifetime	**$0.0272**
Utility Program Cost per kW at Gen	**$358**

INSULATION REBATE PROGRAM

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$173,120	$173,120	$173,120	$201,437
T & D	N/A	$29,749	$29,749	$29,749	$34,847
Marginal Energy	N/A	$81,235	$81,235	$81,235	$99,155
Environmental Externality	N/A	N/A	N/A	N/A	$11,488
Subtotal	N/A	$284,104	$284,104	$284,104	$346,928
Participant Benefits					
Bill Reduction - Electric	$438,424	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$40,795	N/A	N/A	$40,795	$40,795
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$479,218	N/A	N/A	$40,795	$40,795
Total Benefits	$479,218	$284,104	$284,104	$324,899	$387,722
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$42,884	$42,884	$42,884	$42,884
Advertising & Promotion	N/A	$5,000	$5,000	$5,000	$5,000
Measurement & Verification	N/A	$2,000	$2,000	$2,000	$2,000
Rebates	N/A	$40,795	$40,795	$40,795	$40,795
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$90,678	$90,678	$90,678	$90,678
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$438,424	N/A	N/A
Subtotal	N/A	N/A	$438,424	N/A	N/A
Participant Costs					
Incremental Capital Costs	$353,939	N/A	N/A	$353,939	$280,602
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$353,939	N/A	N/A	$353,939	$280,602
Total Costs	$353,939	$90,678	$529,102	$444,617	$371,280
Net Benefit (Cost)	**$125,280**	**$193,425**	**($244,998)**	**($119,719)**	**$16,442**
Benefit/Cost Ratio	**1.35**	**3.13**	**0.54**	**0.73**	**1.04**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	15.2 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.19 kW
Gross Annual kWh Saved at Customer	147 kWh
Net Annual kWh Saved at Generator	160 kWh

Program Summary All Participants	
Total Participants	**1,381**
Total Budget	**$90,678**
Net coincident kW Saved at Generator	**256 kW**
Gross Annual kWh Saved at Customer	203,685 kWh
Net Annual kWh Saved at Generator	**221,301 kWh**

Utility Program Cost per kWh Lifetime	**$0.0270**
Utility Program Cost per kW at Gen	**$355**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **INSULATION REBATE PROGRAM**

Input Data	
1) Retail Rate ($/Dth) =	$6.06
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	3.02%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$44,097	$44,768	$45,458
Incentive Costs =	$203,493	$202,718	$204,496
16) Total Utility Project Costs =	$247,590	$247,485	$249,954
17) Direct Participant Costs ($/Part.) =	$1,458	$1,461	$1,463
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	13.4	13.4	13.4
21) Avg. Dth/Part. Saved =	19.77	19.77	19.77
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	996	996	996
24) Total Annual Dth Saved =	19,689	19,689	19,689
25) Incentive/Participant =	$204.31	$203.53	$205.32

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$249	$248	$251
Cost per Participant per Dth =	$86	$86.46	$86.73
Lifetime Energy Reduction (Dth)	793,710		
Societal Cost per Dth	$6.61		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($2,365,088)	0.59
Utility Cost Test	$2,685,545	4.60
Societal Test	$1,030,438	1.20
Participant Test	$1,297,095	1.30

REFRIGERATOR RECYCLING

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$386,032	$386,032	$386,032	$418,189
T & D	N/A	$57,158	$57,158	$57,158	$61,105
Marginal Energy	N/A	$855,059	$855,059	$855,059	$928,498
Environmental Externality	N/A	N/A	N/A	N/A	$191,301
Subtotal	N/A	$1,298,250	$1,298,250	$1,298,250	$1,599,092
Participant Benefits					
Bill Reduction - Electric	$5,628,873	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$354,000	N/A	N/A	$354,000	$354,000
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$5,982,873	N/A	N/A	$354,000	$354,000
Total Benefits	$5,982,873	$1,298,250	$1,298,250	$1,652,250	$1,953,092
Costs					
Utility Project Costs					
Customer Services	N/A	$7,400	$7,400	$7,400	$7,400
Project Administration	N/A	$546,632	$546,632	$546,632	$546,632
Advertising & Promotion	N/A	$210,000	$210,000	$210,000	$210,000
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$354,000	$354,000	$354,000	$354,000
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,118,032	$1,118,032	$1,118,032	$1,118,032
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$5,628,873	N/A	N/A
Subtotal	N/A	N/A	$5,628,873	N/A	N/A
Participant Costs					
Incremental Capital Costs	$9,000	N/A	N/A	$9,000	$9,000
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$9,000	N/A	N/A	$9,000	$9,000
Total Costs	$9,000	$1,118,032	$6,746,905	$1,127,032	$1,127,032
Net Benefit (Cost)	**$5,973,873**	**$180,218**	**($5,448,656)**	**$525,218**	**$826,060**
Benefit/Cost Ratio	**664.76**	**1.16**	**0.19**	**1.47**	**1.73**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	7.2 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.14 kW
Gross Annual kWh Saved at Customer	850 kWh
Net Annual kWh Saved at Generator	923 kWh

Program Summary All Participants	
Total Participants	**6,900**
Total Budget	**$1,118,032**
Net coincident kW Saved at Generator	**932 kW**
Gross Annual kWh Saved at Customer	5,862,249 kWh
Net Annual kWh Saved at Generator	**6,369,241 kWh**

Utility Program Cost per kWh Lifetime	**$0.0244**
Utility Program Cost per kW at Gen	**$1,200**

REFRIGERATOR RECYCLING

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$429,622	$429,622	$429,622	$467,524
T & D	N/A	$59,351	$59,351	$59,351	$63,406
Marginal Energy	N/A	$907,918	$907,918	$907,918	$984,629
Environmental Externality	N/A	N/A	N/A	N/A	$237,621
Subtotal	N/A	$1,396,891	$1,396,891	$1,396,891	$1,753,180
Participant Benefits					
Bill Reduction - Electric	$5,711,998	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$353,500	N/A	N/A	$353,500	$353,500
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$6,065,498	N/A	N/A	$353,500	$353,500
Total Benefits	$6,065,498	$1,396,891	$1,396,891	$1,750,391	$2,106,680
Costs					
Utility Project Costs					
Customer Services	N/A	$11,100	$11,100	$11,100	$11,100
Project Administration	N/A	$561,312	$561,312	$561,312	$561,312
Advertising & Promotion	N/A	$210,000	$210,000	$210,000	$210,000
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$353,500	$353,500	$353,500	$353,500
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,135,912	$1,135,912	$1,135,912	$1,135,912
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$5,711,998	N/A	N/A
Subtotal	N/A	N/A	$5,711,998	N/A	N/A
Participant Costs					
Incremental Capital Costs	$13,500	N/A	N/A	$13,500	$13,500
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$13,500	N/A	N/A	$13,500	$13,500
Total Costs	$13,500	$1,135,912	$6,847,910	$1,149,412	$1,149,412
Net Benefit (Cost)	**$6,051,998**	**$260,979**	**($5,451,019)**	**$600,979**	**$957,268**
Benefit/Cost Ratio	**449.30**	**1.23**	**0.20**	**1.52**	**1.83**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	7.2 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.15 kW
Gross Annual kWh Saved at Customer	855 kWh
Net Annual kWh Saved at Generator	929 kWh

Program Summary All Participants	
Total Participants	**6,800**
Total Budget	**$1,135,912**
Net coincident kW Saved at Generator	**994 kW**
Gross Annual kWh Saved at Customer	5,812,939 kWh
Net Annual kWh Saved at Generator	**6,315,666 kWh**

Utility Program Cost per kWh Lifetime	**$0.0250**
Utility Program Cost per kW at Gen	**$1,143**

REFRIGERATOR RECYCLING

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$474,803	$474,803	$474,803	$518,668
T & D	N/A	$61,614	$61,614	$61,614	$65,781
Marginal Energy	N/A	$972,319	$972,319	$972,319	$1,050,855
Environmental Externality	N/A	N/A	N/A	N/A	$148,596
Subtotal	N/A	$1,508,736	$1,508,736	$1,508,736	$1,783,900
Participant Benefits					
Bill Reduction - Electric	$5,794,350	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$353,000	N/A	N/A	$353,000	$353,000
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$6,147,350	N/A	N/A	$353,000	$353,000
Total Benefits	$6,147,350	$1,508,736	$1,508,736	$1,861,736	$2,136,900
Costs					
Utility Project Costs					
Customer Services	N/A	$14,800	$14,800	$14,800	$14,800
Project Administration	N/A	$576,023	$576,023	$576,023	$576,023
Advertising & Promotion	N/A	$213,000	$213,000	$213,000	$213,000
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$353,000	$353,000	$353,000	$353,000
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,156,823	$1,156,823	$1,156,823	$1,156,823
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$5,794,350	N/A	N/A
Subtotal	N/A	N/A	$5,794,350	N/A	N/A
Participant Costs					
Incremental Capital Costs	$18,000	N/A	N/A	$18,000	$18,000
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$18,000	N/A	N/A	$18,000	$18,000
Total Costs	$18,000	$1,156,823	$6,951,173	$1,174,823	$1,174,823
Net Benefit (Cost)	**$6,129,350**	**$351,913**	**($5,442,437)**	**$686,913**	**$962,077**
Benefit/Cost Ratio	**341.52**	**1.30**	**0.22**	**1.58**	**1.82**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	7.2 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.16 kW
Gross Annual kWh Saved at Customer	860 kWh
Net Annual kWh Saved at Generator	935 kWh

Program Summary All Participants	
Total Participants	**6,700**
Total Budget	**$1,156,823**
Net coincident kW Saved at Generator	**1,057 kW**
Gross Annual kWh Saved at Customer	5,763,629 kWh
Net Annual kWh Saved at Generator	**6,262,091 kWh**

Utility Program Cost per kWh Lifetime	**$0.0258**
Utility Program Cost per kW at Gen	**$1,095**

RESIDENTIAL DEMAND RESPONSE

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$11,896,511	$11,896,511	$11,896,511	$13,527,734
T & D	N/A	$93,204	$93,204	$93,204	$102,863
Marginal Energy	N/A	$115,411	$115,411	$115,411	$129,853
Environmental Externality	N/A	N/A	N/A	N/A	$18,321
Subtotal	N/A	$12,105,125	$12,105,125	$12,105,125	$13,778,771
Participant Benefits					
Bill Reduction - Electric	$4,704,545	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$1,048,308	N/A	N/A	$1,048,308	$1,048,308
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$5,752,853	N/A	N/A	$1,048,308	$1,048,308
Total Benefits	$5,752,853	$12,105,125	$12,105,125	$13,153,432	$14,827,079
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$7,495,850	$7,495,850	$7,495,850	$7,495,850
Advertising & Promotion	N/A	$375,000	$375,000	$375,000	$375,000
Measurement & Verification	N/A	$150,000	$150,000	$150,000	$150,000
Rebates	N/A	$1,048,308	$1,048,308	$1,048,308	$1,048,308
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$9,069,158	$9,069,158	$9,069,158	$9,069,158
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$4,704,545	N/A	N/A
Subtotal	N/A	N/A	$4,704,545	N/A	N/A
Participant Costs					
Incremental Capital Costs	$787,069	N/A	N/A	$787,069	$760,203
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$787,069	N/A	N/A	$787,069	$760,203
Total Costs	$787,069	$9,069,158	$13,773,703	$9,856,227	$9,829,361
Net Benefit (Cost)	**$4,965,784**	**$3,035,967**	**($1,668,579)**	**$3,297,205**	**$4,997,718**
Benefit/Cost Ratio	**7.31**	**1.33**	**0.88**	**1.33**	**1.51**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	9.9 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.68 kW
Gross Annual kWh Saved at Customer	15 kWh
Net Annual kWh Saved at Generator	17 kWh

Program Summary All Participants	
Total Participants	**31,465**
Total Budget	**$9,069,158**
Net coincident kW Saved at Generator	**21,242 kW**
Gross Annual kWh Saved at Customer	478,825 kWh
Net Annual kWh Saved at Generator	**520,236 kWh**

Utility Program Cost per kWh Lifetime	**$1.7572**
Utility Program Cost per kW at Gen	**$427**

RESIDENTIAL DEMAND RESPONSE

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$12,134,655	$12,134,655	$12,134,655	$13,798,500
T & D	N/A	$95,402	$95,402	$95,402	$105,289
Marginal Energy	N/A	$122,461	$122,461	$122,461	$137,524
Environmental Externality	N/A	N/A	N/A	N/A	$23,618
Subtotal	N/A	$12,352,518	$12,352,518	$12,352,518	$14,064,931
Participant Benefits					
Bill Reduction - Electric	$4,720,716	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$1,052,236	N/A	N/A	$1,052,236	$1,052,236
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$5,772,952	N/A	N/A	$1,052,236	$1,052,236
Total Benefits	$5,772,952	$12,352,518	$12,352,518	$13,404,754	$15,117,167
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$7,836,275	$7,836,275	$7,836,275	$7,836,275
Advertising & Promotion	N/A	$375,000	$375,000	$375,000	$375,000
Measurement & Verification	N/A	$150,000	$150,000	$150,000	$150,000
Rebates	N/A	$1,052,236	$1,052,236	$1,052,236	$1,052,236
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$9,413,511	$9,413,511	$9,413,511	$9,413,511
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$4,720,716	N/A	N/A
Subtotal	N/A	N/A	$4,720,716	N/A	N/A
Participant Costs					
Incremental Capital Costs	$785,439	N/A	N/A	$785,439	$759,550
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$785,439	N/A	N/A	$785,439	$759,550
Total Costs	$785,439	$9,413,511	$14,134,227	$10,198,950	$10,173,061
Net Benefit (Cost)	**$4,987,513**	**$2,939,007**	**($1,781,709)**	**$3,205,804**	**$4,944,106**
Benefit/Cost Ratio	**7.35**	**1.31**	**0.87**	**1.31**	**1.49**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	9.8 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.67 kW
Gross Annual kWh Saved at Customer	15 kWh
Net Annual kWh Saved at Generator	17 kWh

Program Summary All Participants	
Total Participants	**31,515**
Total Budget	**$9,413,511**
Net coincident kW Saved at Generator	**21,246 kW**
Gross Annual kWh Saved at Customer	486,401 kWh
Net Annual kWh Saved at Generator	**528,467 kWh**

Utility Program Cost per kWh Lifetime	**$1.8210**
Utility Program Cost per kW at Gen	**$443**

RESIDENTIAL DEMAND RESPONSE

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$12,377,637	$12,377,637	$12,377,637	$14,074,760
T & D	N/A	$97,655	$97,655	$97,655	$107,775
Marginal Energy	N/A	$130,127	$130,127	$130,127	$145,632
Environmental Externality	N/A	N/A	N/A	N/A	$16,670
Subtotal	N/A	$12,605,420	$12,605,420	$12,605,420	$14,344,838
Participant Benefits					
Bill Reduction - Electric	$4,738,283	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$1,046,652	N/A	N/A	$1,046,652	$1,046,652
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$5,784,935	N/A	N/A	$1,046,652	$1,046,652
Total Benefits	$5,784,935	$12,605,420	$12,605,420	$13,652,072	$15,391,490
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$8,180,573	$8,180,573	$8,180,573	$8,180,573
Advertising & Promotion	N/A	$375,000	$375,000	$375,000	$375,000
Measurement & Verification	N/A	$150,000	$150,000	$150,000	$150,000
Rebates	N/A	$1,046,652	$1,046,652	$1,046,652	$1,046,652
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$9,752,225	$9,752,225	$9,752,225	$9,752,225
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$4,738,283	N/A	N/A
Subtotal	N/A	N/A	$4,738,283	N/A	N/A
Participant Costs					
Incremental Capital Costs	$783,839	N/A	N/A	$783,839	$758,057
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$783,839	N/A	N/A	$783,839	$758,057
Total Costs	$783,839	$9,752,225	$14,490,508	$10,536,064	$10,510,282
Net Benefit (Cost)	**$5,001,096**	**$2,853,195**	**($1,885,088)**	**$3,116,008**	**$4,881,208**
Benefit/Cost Ratio	**7.38**	**1.29**	**0.87**	**1.30**	**1.46**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	9.6 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.67 kW
Gross Annual kWh Saved at Customer	16 kWh
Net Annual kWh Saved at Generator	17 kWh

Program Summary All Participants	
Total Participants	**31,565**
Total Budget	**$9,752,225**
Net coincident kW Saved at Generator	**21,250 kW**
Gross Annual kWh Saved at Customer	493,977 kWh
Net Annual kWh Saved at Generator	**536,699 kWh**

Utility Program Cost per kWh Lifetime	**$1.8836**
Utility Program Cost per kW at Gen	**$459**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **Residential Demand Response**

Input Data	
1) Retail Rate ($/Dth) =	$6.06
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	3.02%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 First Year	2022 Second Year	2023 Third Year
Administrative & Operating Costs =	$34,380	$34,380	$34,380
Incentive Costs =	$279,442	$276,764	$283,598
16) Total Utility Project Costs =	$313,822	$311,144	$317,978
17) Direct Participant Costs ($/Part.) =	$14	$15	$15
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	10.0	10.0	10.0
21) Avg. Dth/Part. Saved =	2.05	2.05	2.05
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	14,650	14,650	14,650
24) Total Annual Dth Saved =	29,999	29,999	29,999
25) Incentive/Participant =	$19.07	$18.89	$19.36

Cost Summary	1st Yr	2nd Yr	3rd Yr
Utility Cost per Participant =	$21	$21	$22
Cost per Participant per Dth =	$18	$17.47	$17.75
Lifetime Energy Reduction (Dth)	899,971		
Societal Cost per Dth	$1.84		

Test Results	Triennial NPV	Triennial B/C
Ratepayer Impact Measure Test	($2,808,537)	0.58
Utility Cost Test	$3,007,566	4.19
Societal Test	$5,440,576	4.28
Participant Test	$6,017,504	10.43

RESIDENTIAL HEATING AND COOLING

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$6,621,232	$6,621,232	$6,621,232	$7,903,184
T & D	N/A	$1,177,119	$1,177,119	$1,177,119	$1,408,924
Marginal Energy	N/A	$2,937,146	$2,937,146	$2,937,146	$3,642,679
Environmental Externality	N/A	N/A	N/A	N/A	$477,076
Subtotal	N/A	$10,735,497	$10,735,497	$10,735,497	$13,431,863
Participant Benefits					
Bill Reduction - Electric	$16,741,316	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$4,011,181	N/A	N/A	$4,011,181	$4,011,181
Incremental Capital Savings	$320,890	N/A	N/A	$320,890	$299,713
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$21,073,387	N/A	N/A	$4,332,071	$4,310,894
Total Benefits	$21,073,387	$10,735,497	$10,735,497	$15,067,568	$17,742,757
Costs					
Utility Project Costs					
Customer Services	N/A	$3,750	$3,750	$3,750	$3,750
Project Administration	N/A	$628,216	$628,216	$628,216	$628,216
Advertising & Promotion	N/A	$126,300	$126,300	$126,300	$126,300
Measurement & Verification	N/A	$28,000	$28,000	$28,000	$28,000
Rebates	N/A	$4,011,181	$4,011,181	$4,011,181	$4,011,181
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$4,797,447	$4,797,447	$4,797,447	$4,797,447
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$16,741,316	N/A	N/A
Subtotal	N/A	N/A	$16,741,316	N/A	N/A
Participant Costs					
Incremental Capital Costs	$9,506,313	N/A	N/A	$9,506,313	$9,379,425
Incremental O&M Costs	$684	N/A	N/A	$684	$773
Subtotal	$9,506,997	N/A	N/A	$9,506,997	$9,380,198
Total Costs	$9,506,997	$4,797,447	$21,538,764	$14,304,444	$14,177,646
Net Benefit (Cost)	**$11,566,390**	**$5,938,049**	**($10,803,267)**	**$763,123**	**$3,565,111**
Benefit/Cost Ratio	**2.22**	**2.24**	**0.50**	**1.05**	**1.25**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	17.8 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.43 kW
Gross Annual kWh Saved at Customer	378 kWh
Net Annual kWh Saved at Generator	411 kWh

Program Summary All Participants	
Total Participants	**18,640**
Total Budget	**$4,797,447**
Net coincident kW Saved at Generator	**8,031 kW**
Gross Annual kWh Saved at Customer	7,046,309 kWh
Net Annual kWh Saved at Generator	**7,655,703 kWh**

Utility Program Cost per kWh Lifetime	**$0.0352**
Utility Program Cost per kW at Gen	**$597**

RESIDENTIAL HEATING AND COOLING

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$6,753,654	$6,753,654	$6,753,654	$8,061,247
T & D	N/A	$1,204,945	$1,204,945	$1,204,945	$1,442,237
Marginal Energy	N/A	$3,112,219	$3,112,219	$3,112,219	$3,858,689
Environmental Externality	N/A	N/A	N/A	N/A	$564,391
Subtotal	N/A	$11,070,818	$11,070,818	$11,070,818	$13,926,564
Participant Benefits					
Bill Reduction - Electric	$17,273,489	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$4,018,893	N/A	N/A	$4,018,893	$4,018,893
Incremental Capital Savings	$337,147	N/A	N/A	$337,147	$321,470
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$21,629,529	N/A	N/A	$4,356,040	$4,340,363
Total Benefits	$21,629,529	$11,070,818	$11,070,818	$15,426,858	$18,266,927
Costs					
Utility Project Costs					
Customer Services	N/A	$3,750	$3,750	$3,750	$3,750
Project Administration	N/A	$652,341	$652,341	$652,341	$652,341
Advertising & Promotion	N/A	$132,600	$132,600	$132,600	$132,600
Measurement & Verification	N/A	$29,500	$29,500	$29,500	$29,500
Rebates	N/A	$4,018,893	$4,018,893	$4,018,893	$4,018,893
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$4,837,085	$4,837,085	$4,837,085	$4,837,085
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$17,273,489	N/A	N/A
Subtotal	N/A	N/A	$17,273,489	N/A	N/A
Participant Costs					
Incremental Capital Costs	$9,498,869	N/A	N/A	$9,498,869	$9,375,880
Incremental O&M Costs	$684	N/A	N/A	$684	$773
Subtotal	$9,499,554	N/A	N/A	$9,499,554	$9,376,653
Total Costs	$9,499,554	$4,837,085	$22,110,574	$14,336,638	$14,213,738
Net Benefit (Cost)	**$12,129,976**	**$6,233,733**	**($11,039,756)**	**$1,090,220**	**$4,053,189**
Benefit/Cost Ratio	**2.28**	**2.29**	**0.50**	**1.08**	**1.29**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	17.8 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.43 kW
Gross Annual kWh Saved at Customer	378 kWh
Net Annual kWh Saved at Generator	411 kWh

Program Summary All Participants	
Total Participants	**18,640**
Total Budget	**$4,837,085**
Net coincident kW Saved at Generator	**8,031 kW**
Gross Annual kWh Saved at Customer	7,046,309 kWh
Net Annual kWh Saved at Generator	**7,655,703 kWh**

Utility Program Cost per kWh Lifetime	**$0.0355**
Utility Program Cost per kW at Gen	**$602**

RESIDENTIAL HEATING AND COOLING

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$6,366,458	$6,366,458	$6,366,458	$7,615,941
T & D	N/A	$1,139,827	$1,139,827	$1,139,827	$1,367,481
Marginal Energy	N/A	$2,965,730	$2,965,730	$2,965,730	$3,689,618
Environmental Externality	N/A	N/A	N/A	N/A	$415,740
Subtotal	N/A	$10,472,015	$10,472,015	$10,472,015	$13,088,779
Participant Benefits					
Bill Reduction - Electric	$15,699,208	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$3,745,215	N/A	N/A	$3,745,215	$3,745,215
Incremental Capital Savings	$358,006	N/A	N/A	$358,006	$324,897
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$19,802,429	N/A	N/A	$4,103,221	$4,070,112
Total Benefits	$19,802,429	$10,472,015	$10,472,015	$14,575,237	$17,158,891
Costs					
Utility Project Costs					
Customer Services	N/A	$3,750	$3,750	$3,750	$3,750
Project Administration	N/A	$677,324	$677,324	$677,324	$677,324
Advertising & Promotion	N/A	$138,900	$138,900	$138,900	$138,900
Measurement & Verification	N/A	$31,000	$31,000	$31,000	$31,000
Rebates	N/A	$3,745,215	$3,745,215	$3,745,215	$3,745,215
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$4,596,189	$4,596,189	$4,596,189	$4,596,189
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$15,699,208	N/A	N/A
Subtotal	N/A	N/A	$15,699,208	N/A	N/A
Participant Costs					
Incremental Capital Costs	$8,056,521	N/A	N/A	$8,056,521	$7,934,447
Incremental O&M Costs	$684	N/A	N/A	$684	$773
Subtotal	$8,057,205	N/A	N/A	$8,057,205	$7,935,221
Total Costs	$8,057,205	$4,596,189	$20,295,397	$12,653,395	$12,531,410
Net Benefit (Cost)	**$11,745,224**	**$5,875,826**	**($9,823,382)**	**$1,921,842**	**$4,627,482**
Benefit/Cost Ratio	**2.46**	**2.28**	**0.52**	**1.15**	**1.37**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	18.3 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.39 kW
Gross Annual kWh Saved at Customer	322 kWh
Net Annual kWh Saved at Generator	350 kWh

Program Summary All Participants	
Total Participants	**18,640**
Total Budget	**$4,596,189**
Net coincident kW Saved at Generator	**7,347 kW**
Gross Annual kWh Saved at Customer	5,996,809 kWh
Net Annual kWh Saved at Generator	**6,515,438 kWh**

Utility Program Cost per kWh Lifetime	**$0.0386**
Utility Program Cost per kW at Gen	**$626**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **Residential Heating and Cooling**

Input Data	
1) Retail Rate ($/Dth) =	$6.06
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	3.02%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$295,592	$308,903	$322,769
Incentive Costs =	$2,880,657	$2,873,574	$2,890,747
16) Total Utility Project Costs =	$3,176,249	$3,182,477	$3,213,516
17) Direct Participant Costs ($/Part.) =	$492	$493	$495
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	18.3	18.3	18.3
21) Avg. Dth/Part. Saved =	7.08	7.08	7.08
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	19,670	19,670	19,670
24) Total Annual Dth Saved =	139,188	139,188	139,188
25) Incentive/Participant =	$146.45	$146.09	$146.96

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$161	$162	$163
Cost per Participant per Dth =	$92	$92.50	$92.98
Lifetime Energy Reduction (Dth)	7,622,773		
Societal Cost per Dth	$5.11		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($24,977,824)	0.57
Utility Cost Test	$23,050,048	3.41
Societal Test	$24,921,332	1.64
Participant Test	$27,582,897	1.95

SCHOOL EDUCATION KITS

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$1,122,106	$1,122,106	$1,122,106	$1,263,546
T & D	N/A	$198,794	$198,794	$198,794	$224,153
Marginal Energy	N/A	$1,262,596	$1,262,596	$1,262,596	$1,519,763
Environmental Externality	N/A	N/A	N/A	N/A	$223,224
Subtotal	N/A	$2,583,496	$2,583,496	$2,583,496	$3,230,686
Participant Benefits					
Bill Reduction - Electric	$7,675,938	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$544,732	N/A	N/A	$544,732	$544,732
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$1,945,002	N/A	N/A	$1,945,002	$2,197,105
Subtotal	$10,165,672	N/A	N/A	$2,489,734	$2,741,837
Total Benefits	$10,165,672	$2,583,496	$2,583,496	$5,073,230	$5,972,523
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$475,921	$475,921	$475,921	$475,921
Advertising & Promotion	N/A	$5,000	$5,000	$5,000	$5,000
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$544,732	$544,732	$544,732	$544,732
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,025,652	$1,025,652	$1,025,652	$1,025,652
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$7,675,938	N/A	N/A
Subtotal	N/A	N/A	$7,675,938	N/A	N/A
Participant Costs					
Incremental Capital Costs	$544,732	N/A	N/A	$544,732	$544,732
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$544,732	N/A	N/A	$544,732	$544,732
Total Costs	$544,732	$1,025,652	$8,701,590	$1,570,384	$1,570,384
Net Benefit (Cost)	**$9,620,940**	**$1,557,844**	**($6,118,094)**	**$3,502,846**	**$4,402,139**
Benefit/Cost Ratio	**18.66**	**2.52**	**0.30**	**3.23**	**3.80**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	11.8 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.06 kW
Gross Annual kWh Saved at Customer	244 kWh
Net Annual kWh Saved at Generator	148 kWh

Program Summary All Participants	
Total Participants	**31,500**
Total Budget	**$1,025,652**
Net coincident kW Saved at Generator	**1,962 kW**
Gross Annual kWh Saved at Customer	7,680,831 kWh
Net Annual kWh Saved at Generator	**4,650,469 kWh**

Utility Program Cost per kWh Lifetime	**$0.0188**
Utility Program Cost per kW at Gen	**$523**

SCHOOL EDUCATION KITS

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$1,222,600	$1,222,600	$1,222,600	$1,374,663
T & D	N/A	$217,317	$217,317	$217,317	$244,665
Marginal Energy	N/A	$1,398,864	$1,398,864	$1,398,864	$1,676,891
Environmental Externality	N/A	N/A	N/A	N/A	$287,068
Subtotal	N/A	$2,838,781	$2,838,781	$2,838,781	$3,583,287
Participant Benefits					
Bill Reduction - Electric	$8,247,087	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$608,342	N/A	N/A	$608,342	$608,342
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$2,087,316	N/A	N/A	$2,087,316	$2,357,865
Subtotal	$10,942,744	N/A	N/A	$2,695,657	$2,966,206
Total Benefits	$10,942,744	$2,838,781	$2,838,781	$5,534,438	$6,549,493
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$557,861	$557,861	$557,861	$557,861
Advertising & Promotion	N/A	$5,000	$5,000	$5,000	$5,000
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$608,342	$608,342	$608,342	$608,342
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,171,203	$1,171,203	$1,171,203	$1,171,203
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$8,247,087	N/A	N/A
Subtotal	N/A	N/A	$8,247,087	N/A	N/A
Participant Costs					
Incremental Capital Costs	$608,342	N/A	N/A	$608,342	$608,342
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$608,342	N/A	N/A	$608,342	$608,342
Total Costs	$608,342	$1,171,203	$9,418,290	$1,779,544	$1,779,544
Net Benefit (Cost)	**$10,334,403**	**$1,667,578**	**($6,579,509)**	**$3,754,894**	**$4,769,949**
Benefit/Cost Ratio	**17.99**	**2.42**	**0.30**	**3.11**	**3.68**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	11.5 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.06 kW
Gross Annual kWh Saved at Customer	243 kWh
Net Annual kWh Saved at Generator	146 kWh

Program Summary All Participants	
Total Participants	**34,000**
Total Budget	**$1,171,203**
Net coincident kW Saved at Generator	**2,112 kW**
Gross Annual kWh Saved at Customer	8,275,909 kWh
Net Annual kWh Saved at Generator	**4,979,865 kWh**

Utility Program Cost per kWh Lifetime	**$0.0204**
Utility Program Cost per kW at Gen	**$555**

SCHOOL EDUCATION KITS

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$1,326,670	$1,326,670	$1,326,670	$1,489,723
T & D	N/A	$236,609	$236,609	$236,609	$266,028
Marginal Energy	N/A	$1,555,401	$1,555,401	$1,555,401	$1,854,728
Environmental Externality	N/A	N/A	N/A	N/A	$229,176
Subtotal	N/A	$3,118,681	$3,118,681	$3,118,681	$3,839,656
Participant Benefits					
Bill Reduction - Electric	$8,851,888	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$671,952	N/A	N/A	$671,952	$671,952
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$2,229,629	N/A	N/A	$2,229,629	$2,518,624
Subtotal	$11,753,469	N/A	N/A	$2,901,581	$3,190,576
Total Benefits	$11,753,469	$3,118,681	$3,118,681	$6,020,262	$7,030,232
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$646,021	$646,021	$646,021	$646,021
Advertising & Promotion	N/A	$5,000	$5,000	$5,000	$5,000
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$671,952	$671,952	$671,952	$671,952
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,322,973	$1,322,973	$1,322,973	$1,322,973
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$8,851,888	N/A	N/A
Subtotal	N/A	N/A	$8,851,888	N/A	N/A
Participant Costs					
Incremental Capital Costs	$671,952	N/A	N/A	$671,952	$671,952
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$671,952	N/A	N/A	$671,952	$671,952
Total Costs	$671,952	$1,322,973	$10,174,861	$1,994,924	$1,994,924
Net Benefit (Cost)	**$11,081,518**	**$1,795,708**	**($7,056,180)**	**$4,025,337**	**$5,035,308**
Benefit/Cost Ratio	**17.49**	**2.36**	**0.31**	**3.02**	**3.52**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	11.3 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.06 kW
Gross Annual kWh Saved at Customer	243 kWh
Net Annual kWh Saved at Generator	145 kWh

Program Summary All Participants	
Total Participants	**36,500**
Total Budget	**$1,322,973**
Net coincident kW Saved at Generator	**2,262 kW**
Gross Annual kWh Saved at Customer	8,870,988 kWh
Net Annual kWh Saved at Generator	**5,309,262 kWh**

Utility Program Cost per kWh Lifetime	**$0.0220**
Utility Program Cost per kW at Gen	**$585**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **School Education Kits**

Input Data	
1) Retail Rate ($/Dth) =	$6.06
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	3.02%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$294,361	$379,847	$472,163
Incentive Costs =	$68,754	$76,894	$85,034
16) Total Utility Project Costs =	$363,115	$456,741	$557,198
17) Direct Participant Costs ($/Part.) =	$4	$4	$4
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$508	$504	$500
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	9.9	9.9	9.9
21) Avg. Dth/Part. Saved =	4.66	4.65	4.64
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	16,500	19,000	21,500
24) Total Annual Dth Saved =	76,861	88,264	99,667
25) Incentive/Participant =	$4.17	$4.05	$3.96

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$22	$24	$26
Cost per Participant per Dth =	$6	$6.05	$6.44
Lifetime Energy Reduction (Dth)	2,631,164		
Societal Cost per Dth	$0.61		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($6,854,961)	0.63
Utility Cost Test	$10,222,758	8.42
Societal Test	$45,688,862	29.42
Participant Test	$45,778,533	199.45

WHOLE HOME EFFICIENCY

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$27,211	$27,211	$27,211	$31,828
T & D	N/A	$4,536	$4,536	$4,536	$5,357
Marginal Energy	N/A	$26,441	$26,441	$26,441	$32,077
Environmental Externality	N/A	N/A	N/A	N/A	$4,850
Subtotal	N/A	$58,188	$58,188	$58,188	$74,111
Participant Benefits					
Bill Reduction - Electric	$165,526	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$23,732	N/A	N/A	$23,732	$23,732
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$189,258	N/A	N/A	$23,732	$23,732
Total Benefits	$189,258	$58,188	$58,188	$81,920	$97,844
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$15,526	$15,526	$15,526	$15,526
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$23,732	$23,732	$23,732	$23,732
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$39,258	$39,258	$39,258	$39,258
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$165,526	N/A	N/A
Subtotal	N/A	N/A	$165,526	N/A	N/A
Participant Costs					
Incremental Capital Costs	$62,980	N/A	N/A	$62,980	$56,884
Incremental O&M Costs	$1,369	N/A	N/A	$1,369	$1,546
Subtotal	$64,349	N/A	N/A	$64,349	$58,430
Total Costs	$64,349	$39,258	$204,784	$103,607	$97,689
Net Benefit (Cost)	**$124,909**	**$18,930**	**($146,596)**	**($21,687)**	**$155**
Benefit/Cost Ratio	**2.94**	**1.48**	**0.28**	**0.79**	**1.00**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	14.3 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.19 kW
Gross Annual kWh Saved at Customer	420 kWh
Net Annual kWh Saved at Generator	457 kWh

Program Summary All Participants	
Total Participants	**212**
Total Budget	**$39,258**
Net coincident kW Saved at Generator	**41 kW**
Gross Annual kWh Saved at Customer	89,108 kWh
Net Annual kWh Saved at Generator	**96,815 kWh**

Utility Program Cost per kWh Lifetime	**$0.0284**
Utility Program Cost per kW at Gen	**$952**

WHOLE HOME EFFICIENCY

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$29,689	$29,689	$29,689	$34,775
T & D	N/A	$4,986	$4,986	$4,986	$5,895
Marginal Energy	N/A	$32,435	$32,435	$32,435	$39,445
Environmental Externality	N/A	N/A	N/A	N/A	$6,853
Subtotal	N/A	$67,110	$67,110	$67,110	$86,969
Participant Benefits					
Bill Reduction - Electric	$198,391	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$27,317	N/A	N/A	$27,317	$27,317
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$225,709	N/A	N/A	$27,317	$27,317
Total Benefits	$225,709	$67,110	$67,110	$94,427	$114,286
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$16,219	$16,219	$16,219	$16,219
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$27,317	$27,317	$27,317	$27,317
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$43,536	$43,536	$43,536	$43,536
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$198,391	N/A	N/A
Subtotal	N/A	N/A	$198,391	N/A	N/A
Participant Costs					
Incremental Capital Costs	$69,687	N/A	N/A	$69,687	$63,289
Incremental O&M Costs	$1,369	N/A	N/A	$1,369	$1,546
Subtotal	$71,056	N/A	N/A	$71,056	$64,835
Total Costs	$71,056	$43,536	$241,927	$114,592	$108,371
Net Benefit (Cost)	**$154,653**	**$23,574**	**($174,818)**	**($20,165)**	**$5,915**
Benefit/Cost Ratio	**3.18**	**1.54**	**0.28**	**0.82**	**1.05**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	14.4 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.19 kW
Gross Annual kWh Saved at Customer	440 kWh
Net Annual kWh Saved at Generator	478 kWh

Program Summary All Participants	
Total Participants	**234**
Total Budget	**$43,536**
Net coincident kW Saved at Generator	**44 kW**
Gross Annual kWh Saved at Customer	103,022 kWh
Net Annual kWh Saved at Generator	**111,932 kWh**

Utility Program Cost per kWh Lifetime	**$0.0270**
Utility Program Cost per kW at Gen	**$990**

WHOLE HOME EFFICIENCY

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$33,653	$33,653	$33,653	$39,383
T & D	N/A	$5,638	$5,638	$5,638	$6,665
Marginal Energy	N/A	$44,846	$44,846	$44,846	$54,503
Environmental Externality	N/A	N/A	N/A	N/A	$7,181
Subtotal	N/A	$84,137	$84,137	$84,137	$107,732
Participant Benefits					
Bill Reduction - Electric	$267,079	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$34,843	N/A	N/A	$34,843	$34,843
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$301,922	N/A	N/A	$34,843	$34,843
Total Benefits	$301,922	$84,137	$84,137	$118,981	$142,576
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$17,120	$17,120	$17,120	$17,120
Advertising & Promotion	N/A	$0	$0	$0	$0
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$34,843	$34,843	$34,843	$34,843
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$51,964	$51,964	$51,964	$51,964
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$267,079	N/A	N/A
Subtotal	N/A	N/A	$267,079	N/A	N/A
Participant Costs					
Incremental Capital Costs	$83,673	N/A	N/A	$83,673	$76,755
Incremental O&M Costs	$1,711	N/A	N/A	$1,711	$1,933
Subtotal	$85,384	N/A	N/A	$85,384	$78,688
Total Costs	$85,384	$51,964	$319,042	$137,347	$130,652
Net Benefit (Cost)	**$216,538**	**$32,174**	**($234,905)**	**($18,367)**	**$11,924**
Benefit/Cost Ratio	**3.54**	**1.62**	**0.26**	**0.87**	**1.09**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	14.4 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.19 kW
Gross Annual kWh Saved at Customer	502 kWh
Net Annual kWh Saved at Generator	545 kWh

Program Summary All Participants	
Total Participants	**268**
Total Budget	**$51,964**
Net coincident kW Saved at Generator	**50 kW**
Gross Annual kWh Saved at Customer	134,544 kWh
Net Annual kWh Saved at Generator	**146,180 kWh**

Utility Program Cost per kWh Lifetime	**$0.0247**
Utility Program Cost per kW at Gen	**$1,047**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **Whole Home Efficiency**

Input Data	
1) Retail Rate ($/Dth) =	$6.06
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	3.02%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$84,014	$88,373	$92,981
Incentive Costs =	$32,421	$34,845	$38,359
16) Total Utility Project Costs =	$116,436	$123,218	$131,340
17) Direct Participant Costs ($/Part.) =	$1,094	$1,117	$1,109
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	16.4	16.4	16.4
21) Avg. Dth/Part. Saved =	14.76	14.93	14.85
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	198	212	234
24) Total Annual Dth Saved =	2,922	3,164	3,475
25) Incentive/Participant =	$163.74	$164.36	$163.93

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$588	$581	$561
Cost per Participant per Dth =	$114	$113.74	$112.46
Lifetime Energy Reduction (Dth)	156,979		
Societal Cost per Dth	$7.03		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($689,684)	0.49
Utility Cost Test	$303,852	1.82
Societal Test	$139,885	1.13
Participant Test	$386,397	1.54

LOW INCOME SEGMENT TOTAL

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$375,322	$375,322	$375,322	$427,259
T & D	N/A	$48,302	$48,302	$48,302	$56,143
Marginal Energy	N/A	$545,331	$545,331	$545,331	$676,543
Environmental Externality	N/A	N/A	N/A	N/A	$101,979
Subtotal	N/A	$968,954	$968,954	$968,954	$1,261,924
Participant Benefits					
Bill Reduction - Electric	$3,542,052	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$1,980,684	N/A	N/A	$1,980,684	$1,980,684
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$203,446	N/A	N/A	$203,446	$229,816
Subtotal	$5,726,183	N/A	N/A	$2,184,130	$2,210,500
Total Benefits	$5,726,183	$968,954	$968,954	$3,153,085	$3,472,424
Costs					
Utility Project Costs					
Customer Services	N/A	$185,933	$185,933	$185,933	$185,933
Project Administration	N/A	$491,546	$491,546	$491,546	$491,546
Advertising & Promotion	N/A	$170,043	$170,043	$170,043	$170,043
Measurement & Verification	N/A	$19,387	$19,387	$19,387	$19,387
Rebates	N/A	$1,980,684	$1,980,684	$1,980,684	$1,980,684
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$2,847,592	$2,847,592	$2,847,592	$2,847,592
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$3,542,052	N/A	N/A
Subtotal	N/A	N/A	$3,542,052	N/A	N/A
Participant Costs					
Incremental Capital Costs	$1,892,958	N/A	N/A	$1,892,958	$1,890,568
Incremental O&M Costs	$1,312	N/A	N/A	$1,312	$1,449
Subtotal	$1,894,269	N/A	N/A	$1,894,269	$1,892,017
Total Costs	$1,894,269	$2,847,592	$6,389,645	$4,741,862	$4,739,609
Net Benefit (Cost)	**$3,831,913**	**($1,878,638)**	**($5,420,690)**	**($1,588,777)**	**($1,267,186)**
Benefit/Cost Ratio	**3.02**	**0.34**	**0.15**	**0.66**	**0.73**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.7 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.13 kW
Gross Annual kWh Saved at Customer	299 kWh
Net Annual kWh Saved at Generator	321 kWh

Program Summary All Participants	
Total Participants	**5,410**
Total Budget	**$2,847,592**
Net coincident kW Saved at Generator	**708 kW**
Gross Annual kWh Saved at Customer	1,615,520 kWh
Net Annual kWh Saved at Generator	**1,737,820 kWh**

Utility Program Cost per kWh Lifetime	**$0.0984**
Utility Program Cost per kW at Gen	**$4,021**

LOW INCOME SEGMENT TOTAL

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$439,456	$439,456	$439,456	$497,993
T & D	N/A	$53,632	$53,632	$53,632	$62,316
Marginal Energy	N/A	$620,045	$620,045	$620,045	$768,812
Environmental Externality	N/A	N/A	N/A	N/A	$130,032
Subtotal	N/A	$1,113,134	$1,113,134	$1,113,134	$1,459,153
Participant Benefits					
Bill Reduction - Electric	$3,916,988	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$2,008,913	N/A	N/A	$2,008,913	$2,008,913
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$228,585	N/A	N/A	$228,585	$258,213
Subtotal	$6,154,486	N/A	N/A	$2,237,498	$2,267,126
Total Benefits	$6,154,486	$1,113,134	$1,113,134	$3,350,632	$3,726,279
Costs					
Utility Project Costs					
Customer Services	N/A	$221,706	$221,706	$221,706	$221,706
Project Administration	N/A	$523,745	$523,745	$523,745	$523,745
Advertising & Promotion	N/A	$174,275	$174,275	$174,275	$174,275
Measurement & Verification	N/A	$19,954	$19,954	$19,954	$19,954
Rebates	N/A	$2,008,913	$2,008,913	$2,008,913	$2,008,913
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$2,948,593	$2,948,593	$2,948,593	$2,948,593
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$3,916,988	N/A	N/A
Subtotal	N/A	N/A	$3,916,988	N/A	N/A
Participant Costs					
Incremental Capital Costs	$1,939,745	N/A	N/A	$1,939,745	$1,936,647
Incremental O&M Costs	$1,312	N/A	N/A	$1,312	$1,449
Subtotal	$1,941,057	N/A	N/A	$1,941,057	$1,938,096
Total Costs	$1,941,057	$2,948,593	$6,865,581	$4,889,650	$4,886,689
Net Benefit (Cost)	**$4,213,429**	**($1,835,459)**	**($5,752,447)**	**($1,539,018)**	**($1,160,410)**
Benefit/Cost Ratio	**3.17**	**0.38**	**0.16**	**0.69**	**0.76**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.7 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.16 kW
Gross Annual kWh Saved at Customer	331 kWh
Net Annual kWh Saved at Generator	356 kWh

Program Summary All Participants	
Total Participants	**5,229**
Total Budget	**$2,948,593**
Net coincident kW Saved at Generator	**850 kW**
Gross Annual kWh Saved at Customer	1,732,088 kWh
Net Annual kWh Saved at Generator	**1,863,863 kWh**

Utility Program Cost per kWh Lifetime	**$0.0950**
Utility Program Cost per kW at Gen	**$3,467**

LOW INCOME SEGMENT TOTAL

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$516,648	$516,648	$516,648	$582,946
T & D	N/A	$59,867	$59,867	$59,867	$69,526
Marginal Energy	N/A	$713,202	$713,202	$713,202	$882,843
Environmental Externality	N/A	N/A	N/A	N/A	$116,879
Subtotal	N/A	$1,289,717	$1,289,717	$1,289,717	$1,652,194
Participant Benefits					
Bill Reduction - Electric	$4,359,335	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$2,113,562	N/A	N/A	$2,113,562	$2,113,562
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$255,826	N/A	N/A	$255,826	$288,985
Subtotal	$6,728,723	N/A	N/A	$2,369,388	$2,402,547
Total Benefits	$6,728,723	$1,289,717	$1,289,717	$3,659,105	$4,054,741
Costs					
Utility Project Costs					
Customer Services	N/A	$210,711	$210,711	$210,711	$210,711
Project Administration	N/A	$560,895	$560,895	$560,895	$560,895
Advertising & Promotion	N/A	$178,860	$178,860	$178,860	$178,860
Measurement & Verification	N/A	$20,545	$20,545	$20,545	$20,545
Rebates	N/A	$2,113,562	$2,113,562	$2,113,562	$2,113,562
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$3,084,572	$3,084,572	$3,084,572	$3,084,572
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$4,359,335	N/A	N/A
Subtotal	N/A	N/A	$4,359,335	N/A	N/A
Participant Costs					
Incremental Capital Costs	$2,014,835	N/A	N/A	$2,014,835	$2,010,784
Incremental O&M Costs	$1,312	N/A	N/A	$1,312	$1,449
Subtotal	$2,016,147	N/A	N/A	$2,016,147	$2,012,233
Total Costs	$2,016,147	$3,084,572	$7,443,907	$5,100,719	$5,096,806
Net Benefit (Cost)	**$4,712,576**	**($1,794,855)**	**($6,154,190)**	**($1,441,614)**	**($1,042,064)**
Benefit/Cost Ratio	**3.34**	**0.42**	**0.17**	**0.72**	**0.80**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.7 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.18 kW
Gross Annual kWh Saved at Customer	322 kWh
Net Annual kWh Saved at Generator	347 kWh

Program Summary All Participants	
Total Participants	**5,789**
Total Budget	**$3,084,572**
Net coincident kW Saved at Generator	**1,021 kW**
Gross Annual kWh Saved at Customer	1,866,486 kWh
Net Annual kWh Saved at Generator	**2,009,241 kWh**

Utility Program Cost per kWh Lifetime	**$0.0922**
Utility Program Cost per kW at Gen	**$3,022**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **Low Income Segment Total**

Input Data	
1) Retail Rate ($/Dth) =	$5.43
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	6.38%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$558,644	$589,537	$635,754
Incentive Costs =	$1,235,463	$1,275,717	$1,286,471
16) Total Utility Project Costs =	$1,794,107	$1,865,253	$1,922,225
17) Direct Participant Costs ($/Part.) =	$1,269	$1,168	$1,210
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$1,331	$1,315	$1,490
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	12.5	12.3	12.2
21) Avg. Dth/Part. Saved =	11.61	11.43	12.41
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	1,012	1,131	1,103
24) Total Annual Dth Saved =	11,753	12,933	13,686
25) Incentive/Participant =	$1,220.81	$1,127.95	$1,166.34

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$1,773	$1,649	$1,743
Cost per Participant per Dth =	$262	$246.37	$237.98
Lifetime Energy Reduction (Dth)	472,624		
Societal Cost per Dth	$20.16		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($6,552,079)	0.24
Utility Cost Test	($3,526,503)	0.37
Societal Test	$2,104,053	1.22
Participant Test	$7,360,005	2.87

HOME ENERGY SAVINGS PROGRAM

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$102,399	$102,399	$102,399	$119,781
T & D	N/A	$13,474	$13,474	$13,474	$15,838
Marginal Energy	N/A	$181,734	$181,734	$181,734	$227,281
Environmental Externality	N/A	N/A	N/A	N/A	$34,398
Subtotal	N/A	$297,606	$297,606	$297,606	$397,298
Participant Benefits					
Bill Reduction - Electric	$1,198,911	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$982,988	N/A	N/A	$982,988	$982,988
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$3,666	N/A	N/A	$3,666	$4,141
Subtotal	$2,185,565	N/A	N/A	$986,654	$987,129
Total Benefits	$2,185,565	$297,606	$297,606	$1,284,260	$1,384,427
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$224,399	$224,399	$224,399	$224,399
Advertising & Promotion	N/A	$146,723	$146,723	$146,723	$146,723
Measurement & Verification	N/A	$10,057	$10,057	$10,057	$10,057
Rebates	N/A	$982,988	$982,988	$982,988	$982,988
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,364,167	$1,364,167	$1,364,167	$1,364,167
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$1,198,911	N/A	N/A
Subtotal	N/A	N/A	$1,198,911	N/A	N/A
Participant Costs					
Incremental Capital Costs	$986,766	N/A	N/A	$986,766	$986,766
Incremental O&M Costs	$1,312	N/A	N/A	$1,312	$1,449
Subtotal	$988,078	N/A	N/A	$988,078	$988,215
Total Costs	$988,078	$1,364,167	$2,563,078	$2,352,244	$2,352,382
Net Benefit (Cost)	**$1,197,487**	**($1,066,561)**	**($2,265,472)**	**($1,067,984)**	**($967,954)**
Benefit/Cost Ratio	**2.21**	**0.22**	**0.12**	**0.55**	**0.59**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant

Lifetime (Weighted on Generator kWh)	17.3 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.08 kW
Gross Annual kWh Saved at Customer	275 kWh
Net Annual kWh Saved at Generator	296 kWh

Program Summary All Participants

Total Participants	**1,900**
Total Budget	**$1,364,167**
Net coincident kW Saved at Generator	**147 kW**
Gross Annual kWh Saved at Customer	522,967 kWh
Net Annual kWh Saved at Generator	**562,831 kWh**
Utility Program Cost per kWh Lifetime	**$0.1401**
Utility Program Cost per kW at Gen	**$9,278**

HOME ENERGY SAVINGS PROGRAM

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$105,068	$105,068	$105,068	$122,898
T & D	N/A	$13,792	$13,792	$13,792	$16,213
Marginal Energy	N/A	$192,854	$192,854	$192,854	$241,096
Environmental Externality	N/A	N/A	N/A	N/A	$40,660
Subtotal	N/A	$311,714	$311,714	$311,714	$420,866
Participant Benefits					
Bill Reduction - Electric	$1,236,788	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$982,998	N/A	N/A	$982,998	$982,998
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$3,666	N/A	N/A	$3,666	$4,141
Subtotal	$2,223,453	N/A	N/A	$986,664	$987,139
Total Benefits	$2,223,453	$311,714	$311,714	$1,298,378	$1,408,006
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$226,833	$226,833	$226,833	$226,833
Advertising & Promotion	N/A	$148,190	$148,190	$148,190	$148,190
Measurement & Verification	N/A	$10,158	$10,158	$10,158	$10,158
Rebates	N/A	$982,998	$982,998	$982,998	$982,998
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,368,179	$1,368,179	$1,368,179	$1,368,179
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$1,236,788	N/A	N/A
Subtotal	N/A	N/A	$1,236,788	N/A	N/A
Participant Costs					
Incremental Capital Costs	$986,776	N/A	N/A	$986,776	$986,776
Incremental O&M Costs	$1,312	N/A	N/A	$1,312	$1,449
Subtotal	$988,088	N/A	N/A	$988,088	$988,225
Total Costs	$988,088	$1,368,179	$2,604,968	$2,356,267	$2,356,404
Net Benefit (Cost)	**$1,235,365**	**($1,056,465)**	**($2,293,254)**	**($1,057,889)**	**($948,399)**
Benefit/Cost Ratio	**2.25**	**0.23**	**0.12**	**0.55**	**0.60**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	17.3 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.08 kW
Gross Annual kWh Saved at Customer	273 kWh
Net Annual kWh Saved at Generator	293 kWh

Program Summary All Participants	
Total Participants	**1,919**
Total Budget	**$1,368,179**
Net coincident kW Saved at Generator	**148 kW**
Gross Annual kWh Saved at Customer	522,968 kWh
Net Annual kWh Saved at Generator	**562,832 kWh**
Utility Program Cost per kWh Lifetime	**$0.1405**
Utility Program Cost per kW at Gen	**$9,253**

HOME ENERGY SAVINGS PROGRAM

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$108,437	$108,437	$108,437	$126,828
T & D	N/A	$14,119	$14,119	$14,119	$16,596
Marginal Energy	N/A	$205,977	$205,977	$205,977	$257,108
Environmental Externality	N/A	N/A	N/A	N/A	$34,188
Subtotal	N/A	$328,532	$328,532	$328,532	$434,721
Participant Benefits					
Bill Reduction - Electric	$1,277,496	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$983,018	N/A	N/A	$983,018	$983,018
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$3,666	N/A	N/A	$3,666	$4,141
Subtotal	$2,264,180	N/A	N/A	$986,684	$987,159
Total Benefits	$2,264,180	$328,532	$328,532	$1,315,216	$1,421,880
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$229,587	$229,587	$229,587	$229,587
Advertising & Promotion	N/A	$149,672	$149,672	$149,672	$149,672
Measurement & Verification	N/A	$10,259	$10,259	$10,259	$10,259
Rebates	N/A	$983,018	$983,018	$983,018	$983,018
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$1,372,536	$1,372,536	$1,372,536	$1,372,536
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$1,277,496	N/A	N/A
Subtotal	N/A	N/A	$1,277,496	N/A	N/A
Participant Costs					
Incremental Capital Costs	$986,796	N/A	N/A	$986,796	$986,796
Incremental O&M Costs	$1,312	N/A	N/A	$1,312	$1,449
Subtotal	$988,108	N/A	N/A	$988,108	$988,245
Total Costs	$988,108	$1,372,536	$2,650,032	$2,360,644	$2,360,781
Net Benefit (Cost)	**$1,276,072**	**($1,044,004)**	**($2,321,499)**	**($1,045,427)**	**($938,901)**
Benefit/Cost Ratio	**2.29**	**0.24**	**0.12**	**0.56**	**0.60**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	17.3 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.08 kW
Gross Annual kWh Saved at Customer	270 kWh
Net Annual kWh Saved at Generator	290 kWh

Program Summary All Participants	
Total Participants	**1,938**
Total Budget	**$1,372,536**
Net coincident kW Saved at Generator	**150 kW**
Gross Annual kWh Saved at Customer	522,970 kWh
Net Annual kWh Saved at Generator	**562,834 kWh**
Utility Program Cost per kWh Lifetime	**$0.1410**
Utility Program Cost per kW at Gen	**$9,179**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **Home Energy Savings Program**

Input Data	
1) Retail Rate ($/Dth) =	$6.06
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	3.02%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$272,395	$275,128	$277,888
Incentive Costs =	$1,206,120	$1,237,668	$1,250,489
16) Total Utility Project Costs =	$1,478,514	$1,512,795	$1,528,377
17) Direct Participant Costs ($/Part.) =	$3,721	$3,786	$3,772
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$915	$937	$957
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	14.6	14.3	14.3
21) Avg. Dth/Part. Saved =	18.83	20.39	20.47
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	340	343	347
24) Total Annual Dth Saved =	6,404	6,995	7,103
25) Incentive/Participant =	$3,547.41	$3,608.36	$3,603.71

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$4,349	$4,410	$4,405
Cost per Participant per Dth =	$428	$401.91	$399.47
Lifetime Energy Reduction (Dth)	294,526		
Societal Cost per Dth	$28.49		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($5,119,793)	0.20
Utility Cost Test	($3,248,924)	0.28
Societal Test	($1,619,516)	0.81
Participant Test	$2,657,201	1.69

LOW INCOME HOME ENERGY SQUAD

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$231,566	$231,566	$231,566	$260,769
T & D	N/A	$27,499	$27,499	$27,499	$32,014
Marginal Energy	N/A	$306,968	$306,968	$306,968	$380,513
Environmental Externality	N/A	N/A	N/A	N/A	$57,139
Subtotal	N/A	$566,033	$566,033	$566,033	$730,435
Participant Benefits					
Bill Reduction - Electric	$1,986,294	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$216,427	N/A	N/A	$216,427	$216,427
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$199,780	N/A	N/A	$199,780	$225,675
Subtotal	$2,402,501	N/A	N/A	$416,207	$442,102
Total Benefits	$2,402,501	$566,033	$566,033	$982,240	$1,172,537
Costs					
Utility Project Costs					
Customer Services	N/A	$185,933	$185,933	$185,933	$185,933
Project Administration	N/A	$166,331	$166,331	$166,331	$166,331
Advertising & Promotion	N/A	$21,320	$21,320	$21,320	$21,320
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$216,427	$216,427	$216,427	$216,427
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$590,011	$590,011	$590,011	$590,011
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$1,986,294	N/A	N/A
Subtotal	N/A	N/A	$1,986,294	N/A	N/A
Participant Costs					
Incremental Capital Costs	$138,828	N/A	N/A	$138,828	$136,438
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$138,828	N/A	N/A	$138,828	$136,438
Total Costs	$138,828	$590,011	$2,576,305	$728,839	$726,449
Net Benefit (Cost)	**$2,263,673**	**($23,978)**	**($2,010,271)**	**$253,402**	**$446,088**
Benefit/Cost Ratio	**17.31**	**0.96**	**0.22**	**1.35**	**1.61**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.9 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.31 kW
Gross Annual kWh Saved at Customer	560 kWh
Net Annual kWh Saved at Generator	609 kWh

Program Summary All Participants	
Total Participants	**1,594**
Total Budget	**$590,011**
Net coincident kW Saved at Generator	**487 kW**
Gross Annual kWh Saved at Customer	893,105 kWh
Net Annual kWh Saved at Generator	**970,345 kWh**

Utility Program Cost per kWh Lifetime	**$0.0361**
Utility Program Cost per kW at Gen	**$1,212**

LOW INCOME HOME ENERGY SQUAD

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$291,004	$291,004	$291,004	$326,075
T & D	N/A	$32,123	$32,123	$32,123	$37,371
Marginal Energy	N/A	$366,068	$366,068	$366,068	$453,588
Environmental Externality	N/A	N/A	N/A	N/A	$76,554
Subtotal	N/A	$689,195	$689,195	$689,195	$893,588
Participant Benefits					
Bill Reduction - Electric	$2,305,827	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$229,851	N/A	N/A	$229,851	$229,851
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$224,919	N/A	N/A	$224,919	$254,072
Subtotal	$2,760,597	N/A	N/A	$454,770	$483,923
Total Benefits	$2,760,597	$689,195	$689,195	$1,143,965	$1,377,511
Costs					
Utility Project Costs					
Customer Services	N/A	$221,706	$221,706	$221,706	$221,706
Project Administration	N/A	$189,416	$189,416	$189,416	$189,416
Advertising & Promotion	N/A	$23,985	$23,985	$23,985	$23,985
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$229,851	$229,851	$229,851	$229,851
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$664,958	$664,958	$664,958	$664,958
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$2,305,827	N/A	N/A
Subtotal	N/A	N/A	$2,305,827	N/A	N/A
Participant Costs					
Incremental Capital Costs	$170,945	N/A	N/A	$170,945	$167,847
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$170,945	N/A	N/A	$170,945	$167,847
Total Costs	$170,945	$664,958	$2,970,785	$835,903	$832,805
Net Benefit (Cost)	**$2,589,652**	**$24,237**	**($2,281,590)**	**$308,062**	**$544,706**
Benefit/Cost Ratio	**16.15**	**1.04**	**0.23**	**1.37**	**1.65**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.9 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.46 kW
Gross Annual kWh Saved at Customer	744 kWh
Net Annual kWh Saved at Generator	809 kWh

Program Summary All Participants	
Total Participants	**1,350**
Total Budget	**$664,958**
Net coincident kW Saved at Generator	**627 kW**
Gross Annual kWh Saved at Customer	1,005,051 kWh
Net Annual kWh Saved at Generator	**1,091,972 kWh**

Utility Program Cost per kWh Lifetime	**$0.0361**
Utility Program Cost per kW at Gen	**$1,061**

LOW INCOME HOME ENERGY SQUAD

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$361,936	$361,936	$361,936	$403,836
T & D	N/A	$37,489	$37,489	$37,489	$43,583
Marginal Energy	N/A	$438,843	$438,843	$438,843	$542,950
Environmental Externality	N/A	N/A	N/A	N/A	$71,903
Subtotal	N/A	$838,267	$838,267	$838,267	$1,062,272
Participant Benefits					
Bill Reduction - Electric	$2,677,682	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$296,174	N/A	N/A	$296,174	$296,174
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$252,160	N/A	N/A	$252,160	$284,844
Subtotal	$3,226,016	N/A	N/A	$548,334	$581,018
Total Benefits	$3,226,016	$838,267	$838,267	$1,386,601	$1,643,290
Costs					
Utility Project Costs					
Customer Services	N/A	$210,711	$210,711	$210,711	$210,711
Project Administration	N/A	$216,572	$216,572	$216,572	$216,572
Advertising & Promotion	N/A	$26,983	$26,983	$26,983	$26,983
Measurement & Verification	N/A	$0	$0	$0	$0
Rebates	N/A	$296,174	$296,174	$296,174	$296,174
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$750,440	$750,440	$750,440	$750,440
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$2,677,682	N/A	N/A
Subtotal	N/A	N/A	$2,677,682	N/A	N/A
Participant Costs					
Incremental Capital Costs	$208,411	N/A	N/A	$208,411	$204,360
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$208,411	N/A	N/A	$208,411	$204,360
Total Costs	$208,411	$750,440	$3,428,122	$958,851	$954,800
Net Benefit (Cost)	**$3,017,605**	**$87,827**	**($2,589,855)**	**$427,750**	**$688,490**
Benefit/Cost Ratio	**15.48**	**1.12**	**0.24**	**1.45**	**1.72**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	16.9 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.44 kW
Gross Annual kWh Saved at Customer	630 kWh
Net Annual kWh Saved at Generator	685 kWh

Program Summary All Participants	
Total Participants	**1,793**
Total Budget	**$750,440**
Net coincident kW Saved at Generator	**791 kW**
Gross Annual kWh Saved at Customer	1,129,851 kWh
Net Annual kWh Saved at Generator	**1,227,565 kWh**
Utility Program Cost per kWh Lifetime	**$0.0363**
Utility Program Cost per kW at Gen	**$948**

Conservation Improvement Program (CIP)

BENEFIT COST FOR GAS CIPS-- Cost-Effectiveness Analysis

Company: **Xcel Energy**
Project: **Low Income Home Energy Squad**

Input Data	
1) Retail Rate ($/Dth) =	$6.06
Escalation Rate =	4.69%
2) Non-Gas Fuel Retail Rate ($/Fuel Unit) =	$0.000
Escalation Rate =	4.69%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	kWh
3) Commodity Cost ($/Dth) =	$3.25
Escalation Rate =	4.69%
4) Demand Cost ($/Unit/Yr) =	$82.36
Escalation Rate =	4.69%
5) Peak Reduction Factor =	1.00%
6) Variable O&M ($/Dth) =	$0.0411
Escalation Rate =	4.69%
7) Non-Gas Fuel Cost ($/Fuel Unit) =	$0.00000
Escalation Rate =	3.59%
8) Non-Gas Fuel Loss Factor	0.00%
9) Gas Environmental Damage Factor =	$2.0700
Escalation Rate =	2.30%
10) Non Gas Fuel Enviro. Damage Factor ($/Unit) =	$0.0000
Escalation Rate =	2.30%
11) Participant Discount Rate =	3.02%
12) MN CIP Utility Discount Rate =	5.34%
13) Societal Discount Rate =	3.02%
14) General Input Data Year =	2020
15a) Project Analysis Year 1 =	2021
15b) Project Analysis Year 2 =	2022
15c) Project Analysis Year 3 =	2023

	2021 **First Year**	2022 **Second Year**	2023 **Third Year**
Administrative & Operating Costs =	$286,249	$314,409	$357,866
Incentive Costs =	$29,344	$38,049	$35,982
16) Total Utility Project Costs =	$315,592	$352,458	$393,848
17) Direct Participant Costs ($/Part.) =	$29	$29	$34
18) Participant Non-Energy Costs (Annual $/Part.) =	$0	$0	$0
Escalation Rate =	2.30%	2.30%	2.30%
19) Participant Non-Energy Savings (Annual $/Part) =	$1,542	$1,479	$1,735
Escalation Rate =	2.30%	2.30%	2.30%
20) Project Life (Years) =	10.0	10.0	10.0
21) Avg. Dth/Part. Saved =	7.96	7.54	8.71
22) Avg Non-Gas Fuel Units/Part. Saved =	0 kWh	0 kWh	0 kWh
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0 kWh	0 kWh	0 kWh
23) Number of Participants =	672	788	756
24) Total Annual Dth Saved =	5,349	5,938	6,584
25) Incentive/Participant =	$43.67	$48.29	$47.60

Cost Summary	**1st Yr**	**2nd Yr**	**3rd Yr**
Utility Cost per Participant =	$470	$447	$521
Cost per Participant per Dth =	$63	$63.16	$63.76
Lifetime Energy Reduction (Dth)	178,098		
Societal Cost per Dth	$6.37		

Test Results	**Triennial NPV**	**Triennial B/C**
Ratepayer Impact Measure Test	($1,432,286)	0.35
Utility Cost Test	($277,579)	0.74
Societal Test	$3,723,569	4.28
Participant Test	$4,702,804	70.07

MULTI-FAMILY ENERGY SAVINGS PROGRAM

2021 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$41,357	$41,357	$41,357	$46,709
T & D	N/A	$7,329	$7,329	$7,329	$8,291
Marginal Energy	N/A	$56,629	$56,629	$56,629	$68,749
Environmental Externality	N/A	N/A	N/A	N/A	$10,442
Subtotal	N/A	$105,315	$105,315	$105,315	$134,191
Participant Benefits					
Bill Reduction - Electric	$356,848	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$781,269	N/A	N/A	$781,269	$781,269
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$1,138,117	N/A	N/A	$781,269	$781,269
Total Benefits	$1,138,117	$105,315	$105,315	$886,584	$915,460
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$100,816	$100,816	$100,816	$100,816
Advertising & Promotion	N/A	$2,000	$2,000	$2,000	$2,000
Measurement & Verification	N/A	$9,330	$9,330	$9,330	$9,330
Rebates	N/A	$781,269	$781,269	$781,269	$781,269
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$893,415	$893,415	$893,415	$893,415
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$356,848	N/A	N/A
Subtotal	N/A	N/A	$356,848	N/A	N/A
Participant Costs					
Incremental Capital Costs	$767,364	N/A	N/A	$767,364	$767,364
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$767,364	N/A	N/A	$767,364	$767,364
Total Costs	$767,364	$893,415	$1,250,263	$1,660,779	$1,660,779
Net Benefit (Cost)	**$370,753**	**($788,100)**	**($1,144,947)**	**($774,195)**	**($745,319)**
Benefit/Cost Ratio	**1.48**	**0.12**	**0.08**	**0.53**	**0.55**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2021 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant	
Lifetime (Weighted on Generator kWh)	13.9 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.04 kW
Gross Annual kWh Saved at Customer	104 kWh
Net Annual kWh Saved at Generator	107 kWh

Program Summary All Participants	
Total Participants	**1,916**
Total Budget	**$893,415**
Net coincident kW Saved at Generator	**74 kW**
Gross Annual kWh Saved at Customer	199,448 kWh
Net Annual kWh Saved at Generator	**204,645 kWh**

Utility Program Cost per kWh Lifetime	**$0.3139**
Utility Program Cost per kW at Gen	**$12,039**

MULTI-FAMILY ENERGY SAVINGS PROGRAM

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$43,384	$43,384	$43,384	$49,020
T & D	N/A	$7,717	$7,717	$7,717	$8,733
Marginal Energy	N/A	$61,124	$61,124	$61,124	$74,128
Environmental Externality	N/A	N/A	N/A	N/A	$12,817
Subtotal	N/A	$112,225	$112,225	$112,225	$144,699
Participant Benefits					
Bill Reduction - Electric	$374,372	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$796,064	N/A	N/A	$796,064	$796,064
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$1,170,436	N/A	N/A	$796,064	$796,064
Total Benefits	$1,170,436	$112,225	$112,225	$908,289	$940,762
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$107,496	$107,496	$107,496	$107,496
Advertising & Promotion	N/A	$2,100	$2,100	$2,100	$2,100
Measurement & Verification	N/A	$9,796	$9,796	$9,796	$9,796
Rebates	N/A	$796,064	$796,064	$796,064	$796,064
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$915,456	$915,456	$915,456	$915,456
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$374,372	N/A	N/A
Subtotal	N/A	N/A	$374,372	N/A	N/A
Participant Costs					
Incremental Capital Costs	$782,024	N/A	N/A	$782,024	$782,024
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$782,024	N/A	N/A	$782,024	$782,024
Total Costs	$782,024	$915,456	$1,289,828	$1,697,480	$1,697,480
Net Benefit (Cost)	**$388,412**	**($803,231)**	**($1,177,603)**	**($789,191)**	**($756,717)**
Benefit/Cost Ratio	**1.50**	**0.12**	**0.09**	**0.54**	**0.55**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant

Lifetime (Weighted on Generator kWh)	13.9 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.04 kW
Gross Annual kWh Saved at Customer	104 kWh
Net Annual kWh Saved at Generator	107 kWh

Program Summary All Participants

Total Participants	**1,960**
Total Budget	**$915,456**
Net coincident kW Saved at Generator	**76 kW**
Gross Annual kWh Saved at Customer	204,070 kWh
Net Annual kWh Saved at Generator	**209,060 kWh**
Utility Program Cost per kWh Lifetime	**$0.3160**
Utility Program Cost per kW at Gen	**$12,037**

MULTI-FAMILY ENERGY SAVINGS PROGRAM

2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Total Resource Test ($Total)	Societal Test ($Total)
Benefits					
Avoided Revenue Requirements					
Generation	N/A	$46,275	$46,275	$46,275	$52,282
T & D	N/A	$8,260	$8,260	$8,260	$9,347
Marginal Energy	N/A	$68,383	$68,383	$68,383	$82,785
Environmental Externality	N/A	N/A	N/A	N/A	$10,788
Subtotal	N/A	$122,918	$122,918	$122,918	$155,201
Participant Benefits					
Bill Reduction - Electric	$404,157	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	$834,370	N/A	N/A	$834,370	$834,370
Incremental Capital Savings	$0	N/A	N/A	$0	$0
Incremental O&M Savings	$0	N/A	N/A	$0	$0
Subtotal	$1,238,527	N/A	N/A	$834,370	$834,370
Total Benefits	$1,238,527	$122,918	$122,918	$957,288	$989,571
Costs					
Utility Project Costs					
Customer Services	N/A	$0	$0	$0	$0
Project Administration	N/A	$114,736	$114,736	$114,736	$114,736
Advertising & Promotion	N/A	$2,205	$2,205	$2,205	$2,205
Measurement & Verification	N/A	$10,286	$10,286	$10,286	$10,286
Rebates	N/A	$834,370	$834,370	$834,370	$834,370
Other	N/A	$0	$0	$0	$0
Subtotal	N/A	$961,597	$961,597	$961,597	$961,597
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	$404,157	N/A	N/A
Subtotal	N/A	N/A	$404,157	N/A	N/A
Participant Costs					
Incremental Capital Costs	$819,628	N/A	N/A	$819,628	$819,628
Incremental O&M Costs	$0	N/A	N/A	$0	$0
Subtotal	$819,628	N/A	N/A	$819,628	$819,628
Total Costs	$819,628	$961,597	$1,365,754	$1,781,224	$1,781,224
Net Benefit (Cost)	**$418,899**	**($838,679)**	**($1,242,836)**	**($823,937)**	**($791,653)**
Benefit/Cost Ratio	**1.51**	**0.13**	**0.09**	**0.54**	**0.56**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2023 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant

Lifetime (Weighted on Generator kWh)	13.9 years
T & D Loss Factor (Energy)	7.96%
T & D Loss Factor (Demand)	9.84%
Net coincident kW Saved at Generator	0.04 kW
Gross Annual kWh Saved at Customer	104 kWh
Net Annual kWh Saved at Generator	106 kWh

Program Summary All Participants

Total Participants	**2,058**
Total Budget	**$961,597**
Net coincident kW Saved at Generator	**80 kW**
Gross Annual kWh Saved at Customer	213,665 kWh
Net Annual kWh Saved at Generator	**218,842 kWh**
Utility Program Cost per kWh Lifetime	**$0.3171**
Utility Program Cost per kW at Gen	**$12,085**

Technical Assumptions

This section contains the forecast planning and deemed savings technical assumptions for the proposed programs:

- **Forecast Planning Assumptions** - These assumptions describe the predicted participation, savings, and costs of the measures proposed in the Plan. They represent an average of the values for the expected product mix that we anticipate customers will implement. These assumptions are used to estimate the energy consumption impacts and other measure-specific factors in order to calculate the benefit-cost analyses. The forecasted impacts are derived by applying the anticipated participation for each measure to the Deemed Savings technical assumptions for that measure. The impacts from each of the measures are aggregated and inputted into the benefit-cost model for the program level analysis.

- **Deemed Savings Technical Assumptions** - These assumptions describe how actual energy savings, cost, and other values will be calculated for each measure that is implemented. For **prescriptive** DSM measures, the deemed savings technical assumptions contain the algorithms that will be used to calculate energy and demand savings, as well as all assumed or customer-provided values to be used as inputs to these algorithms. Additionally, the Deemed Savings technical assumptions describe how incremental capital and incremental operation and maintenance costs will be determined for each implemented measure, and detail the values which will be used for the measure life. For **custom** products, the Deemed Savings technical assumptions describe the methodology to be used to calculate project specific savings, as well as any values to be used for all implemented projects under a specific DSM product.

The following table describes each column in the Forecasted Technical Assumptions:

Column Label	**Column Description**
Program	Program name
Measure Group	High efficiency product description
Measure Lifetime (years)	High efficiency product lifetime
Rebate Amount	Average dollar amount per unit of rebate given to participants
Incremental Cost ($)	Difference in efficient and baseline product
Annual Customer kWh Savings (kWh/yr)	Annual kWh savings customer realizes after implementing high efficiency product

Annual Customer Peak Coincident Demand Savings (PCkW/yr)	kW savings utility realizes on annual peak hour after customer implements high efficiency product
Gas Savings (Dth)	Annual Dth savings customer realizes after implementing high efficiency product
Non-Energy O&M Savings ($)	Non energy savings related to O&M
Install Rate (%)	Metric for tracking installations
Units (2021-2023 and Electric and Gas)	Forecast number of units rebated for each fuel and each program year.

Program	Measure Group	Measure Lifetime (years)	Rebate Amount ($)	Incremental Cost ($)	Annual Customer kWh Savings (kWh/yr)	Annual Customer Peak Coincident Demand Savings (PCkW)	Gas Savings (Dth)	Non-Energy O&M Savings ($)	Install Rate (%)	2021 Electric Units	2022 Electric Units	2023 Electric Units	2021 Gas Units	2022 Gas Units	2023 Gas Units
Business Energy Assessments	AC Rewards - Business	10	$202	$202	135	1.387	0.0	$0.00	100%	0	2	3	0	0	0
Business Energy Assessments	BEA Building Assessment	0	$3,500	$5,000	0	0.000	0.0	$0.00	100%	30	35	40	1	2	2
Business Energy Assessments	BEA Industrial Streamlined Assessment	7	$4,025	$4,112	7,562	0.000	90.6	$0.00	100%	21	36	32	0	2	2
Business Energy Assessments	BEA Targeted Building Assessment	0	$15,000	$20,000	0	0.000	0.0	$0.00	100%	3	7	12	0	0	0
Business Energy Assessments	Behavioral Commercial	3	$1,860	$0	92,981	5.778	0.0	$0.00	100%	0	1	1	0	0	0
Business Energy Assessments	Behavioral Industrial	3	$465	$0	23,245	1.445	0.0	$0.00	100%	0	2	3	0	0	0
Business Energy Assessments	Building Assessment RCx Impelementation	7	$3,782	$14,400	118,214	3.695	320.6	$374.36	100%	12	31	43	0	0	0
Business Energy Assessments	Building Operator Certification	5	$500	$641	27,951	1.627	0.0	$0.00	100%	30	30	30	3	3	3
Business Energy Assessments	Business Saver's Switch	15	$0	$0	2	1.460	0.0	$0.00	100%	0	1	2	0	0	0
Business Energy Assessments	Commercial Prescriptive	17	$7,005	$22,408	101,897	15.082	7.5	-$279.30	100%	11	24	31	1	1	1
Business Energy Assessments	Custom BEA Commercial Project	17	$7,127	$32,255	85,715	16.599	113.5	$6.56	100%	5	8	11	1	2	2
Business Energy Assessments	Custom BEA Industrial Project	19	$6,098	$62,073	99,530	11.981	349.7	$2,188.75	100%	5	14	19	1	3	3
Business Energy Assessments	Efficiency Controls Electric Project	15	$8,376	$52,278	170,777	2.244	0.0	$1,461.23	100%	3	5	7	0	0	0
Business Energy Assessments	Efficiency Controls Gas Project	15	$4,005	$47,312	0	0.000	801.1	$1,195.19	100%	0	0	0	0	1	1
Business Energy Assessments	Industrial Prescriptive	17	$4,020	$17,267	63,480	5.655	2.9	$0.00	100%	6	45	67	1	1	1
Business Energy Assessments	Peak Partner Rewards	1	$5,274	$0	986	164.289	0.0	$0.00	100%	0	0	1	0	0	0
Business Energy Assessments	Targeted Building Assessment RCx Impelementation	7	$6,303	$24,001	197,023	6.159	534.4	$623.93	100%	0	0	1	0	0	0
Business New Construction	AC Rewards - Business	10	$175	$175	196	1.041	0.8	$0.00	100%	20	20	20	2	2	2
Business New Construction	AC Rewards-DR	5	$25	$25	1	0.386	0.0	$0.00	70%	0	300	150	0	150	150
Business New Construction	AC Rewards-EE	10	$110	$110	43	0.082	1.4	$0.00	100%	0	300	150	0	150	150
Business New Construction	Business Saver's Switch	15	$0	$0	1	1.067	0.0	$0.00	100%	5	5	5	0	0	0
Business New Construction	Code Compliance	13	$0	$24,891	49,737	22.059	43.2	$0.00	100%	25	67	115	25	67	67
Business New Construction	EDA	20	$47,520	$196,051	314,594	70.264	287.7	-$89.86	100%	125	115	115	40	40	40
Business New Construction	EEB	19	$7,794	$16,026	33,661	8.769	22.8	-$118.08	100%	75	75	75	20	20	20
Business New Construction	Interrupted Rates	0	$0	$0	0	0.000	0.0	$0.00	100%	0	0	0	0	0	0
Business New Construction	Peak Partner Rewards	1	$3,667	$0	685	114.240	0.0	$0.00	100%	0	1	2	0	0	0
Commercial Efficiency	AC Rewards - Business	10	$175	$175	276	1.041	0.8	$0.00	100%	60	60	60	6	6	6
Commercial Efficiency	Behavioral Commercial	3	$1,860	$0	92,981	5.778	0.0	$0.00	100%	1	1	1	1	1	1
Commercial Efficiency	Business Saver's Switch	15	$0	$0	2	1.460	0.0	$0.00	100%	10	10	10	0	0	0
Commercial Efficiency	CE	0	$46,509	$0	0	0.000	0.0	$0.00	100%	10	10	10	3	3	3
Commercial Efficiency	Commercial Efficiency Prescriptive	20	$4,335	$19,295	62,501	7.863	69.7	-$85.93	100%	327	327	327	32	32	32
Commercial Efficiency	Commercial Efficiency Study	0	$13,782	$17,975	0	0.000	0.0	$0.00	100%	8	8	8	2	2	2
Commercial Efficiency	Custom Electric Commercial Efficiency Project	17	$7,752	$34,851	101,300	19.617	0.0	$0.00	100%	63	63	63	0	0	0
Commercial Efficiency	Custom Gas Commercial Efficiency Project	15	$3,689	$17,980	0	0.000	737.8	$42.67	100%	0	0	0	2	2	2
Commercial Efficiency	Data Center Efficiency Implementation	20	$5,709	$86,625	146,829	7.547	0.0	$2,000.00	100%	16	16	16	0	0	0
Commercial Efficiency	EDA	20	$44,971	$193,733	292,904	65.426	402.8	-$83.87	100%	6	6	6	3	3	3
Commercial Efficiency	EEB	20	$7,269	$15,094	29,345	7.645	44.7	-$106.53	100%	10	10	10	6	6	6
Commercial Efficiency	Efficiency Controls Electric Project	15	$8,376	$52,278	170,777	2.244	0.0	$1,461.23	100%	30	30	30	0	0	0
Commercial Efficiency	Efficiency Controls Gas Project	15	$4,005	$47,312	0	0.000	801.1	$1,195.19	100%	0	0	0	10	10	10
Commercial Efficiency	Electric Rate Savings	5	$0	$0	329	164.289	0.0	$0.00	100%	5	5	5	0	0	0
Commercial Efficiency	Peak Partner Rewards	1	$6,559	$0	1,226	204.320	0.0	$0.00	100%	2	4	6	0	0	0
Commercial Efficiency	RCx Impelementation	7	$3,848	$12,402	232,240	2.779	141.2	$0.00	100%	25	25	25	10	10	10
Commercial Streamlined Assessments	AC Rewards - Business	9	$210	$210	66	1.784	0.0	$0.00	100%	3	4	7	0	0	0
Commercial Streamlined Assessments	Business Saver's Switch	15	$0	$0	2	1.460	0.0	$0.00	100%	0	1	2	0	0	0
Commercial Streamlined Assessments	Commercial Streamlined Assessment	0	$1,500	$1,750	0	0.000	0.0	$0.00	100%	100	110	120	6	7	7
Commercial Streamlined Assessments	Custom Turnkey Electric Project	0	$0	$0	0	0.000	0.0	$0.00	100%	0	0	0	0	0	0
Commercial Streamlined Assessments	Custom Turnkey Gas Project	17	$3,209	$11,312	0	0.000	641.8	$0.00	100%	0	0	0	9	11	11
Commercial Streamlined Assessments	Peak Partner Rewards	0	$0	$0	0	0.000	0.0	$0.00	100%	0	0	0	0	0	0
Commercial Streamlined Assessments	Turn Key Services Prescriptive	20	$5,057	$18,353	56,888	10.374	10.3	-$213.03	100%	217	197	182	25	21	21
Compressed Air Efficiency	Custom Compressed Air Project	19	$8,796	$35,264	109,915	16.524	0.0	$62.37	100%	30	33	37	0	0	0
Compressed Air Efficiency	Cycling Dryers	20	$1,071	$1,534	16,644	1.836	0.0	$0.00	100%	37	41	45	0	0	0
Compressed Air Efficiency	Demand Side Study	0	$3,753	$5,003	0	0.000	0.0	$0.00	100%	5	6	6	0	0	0
Compressed Air Efficiency	Dryer Purge Demand Controls	20	$1,862	$3,372	76,597	8.562	0.0	$0.00	100%	3	3	4	0	0	0
Compressed Air Efficiency	ECO	5	$0	$2,568	106,530	12.275	0.0	$0.00	100%	1	1	1	0	0	0
Compressed Air Efficiency	Mist Eliminators	11	$1,320	$3,493	12,191	1.556	0.0	$323.00	100%	14	15	17	0	0	0
Compressed Air Efficiency	New VFD Compressor	20	$3,733	$5,210	19,061	4.957	0.0	$0.00	100%	35	39	43	0	0	0
Compressed Air Efficiency	No Air Loss Drain	13	$200	$323	3,848	0.511	0.0	$0.00	100%	50	55	61	0	0	0
Compressed Air Efficiency	Peak Partner Rewards	1	$4,458	$0	833	138.880	0.0	$0.00	100%	1	2	3	0	0	0
Compressed Air Efficiency	Supply Side Study	5	$5,317	$7,443	58,574	6.460	0.0	$0.00	100%	70	77	85	0	0	0
Custom Efficiency	Custom Custom Electric Project	18	$12,527	$286,390	161,794	22.371	0.0	$71,529.57	100%	28	28	28	0	0	0
Custom Efficiency	Custom Gas Project	19	$12,824	$74,630	0	0.000	2,564.8	$16,050.85	100%	0	0	0	6	6	6
Custom Efficiency	In-Depth Study	0	$13,866	$22,204	0	0.000	0.0	$0.00	100%	2	2	2	1	1	1
Data Center Efficiency	Computer VDI	10	$10	$117	711	0.097	0.0	$305.00	100%	150	150	150	0	0	0
Data Center Efficiency	CRAC Units	20	$2,101	$11,009	50,705	6.843	0.0	$0.00	100%	5	5	5	0	0	0
Data Center Efficiency	Data Center Efficiency Implementation	20	$5,709	$86,625	146,829	7.547	0.0	$2,000.00	100%	11	11	11	0	0	0
Data Center Efficiency	Data Center Efficiency Prescriptive	18	$20,220	$138,910	350,209	13.916	0.0	-$25.89	100%	10	10	10	0	0	0
Data Center Efficiency	EDA	20	$40,444	$96,780	483,333	42.222	0.0	$0.00	100%	0	0	1	0	0	0
Data Center Efficiency	Electric Rate Savings	0	$0	$0	0	0.000	0.0	$0.00	100%	0	0	0	0	0	0
Data Center Efficiency	In-Depth Study	0	$7,350	$9,800	0	0.000	0.0	$0.00	100%	1	0	1	0	0	0
Data Center Efficiency	Peak Partner Rewards	1	$8,259	$0	1,544	257.280	0.0	$0.00	100%	0	1	1	0	0	0
Data Center Efficiency	Plate & Frame Heat Exchangers	20	$21,200	$65,570	180,351	0.000	0.0	$0.00	100%	0	1	0	0	0	0
Efficiency Controls	Business Saver's Switch	15	$0	$0	2	1.460	0.0	$0.00	100%	2	2	2	0	0	0
Efficiency Controls	Demand Control	15	$303	$1,500	490	1.061	0.0	$0.00	100%	1	1	1	0	0	0
Efficiency Controls	Efficiency Controls Electric Project	15	$8,376	$52,278	170,777	2.244	0.0	$1,461.23	100%	63	59	58	0	0	0
Efficiency Controls	Efficiency Controls Gas Project	15	$4,005	$47,312	0	0.000	801.1	$1,195.19	100%	0	0	0	13	15	18

Program	Measure Group	Measure Lifetime (years)	Rebate Amount ($)	Incremental Cost ($)	Annual Customer kWh Savings (kWh/yr)	Annual Customer Peak Coincident Demand Savings (PCkW)	Gas Savings (Dth)	Non-Energy O&M Savings ($)	Install Rate (%)	2021 Electric Units	2022 Electric Units	2023 Electric Units	2021 Gas Units	2022 Gas Units	2023 Gas Units
Efficiency Controls	Peak Partner Rewards	1	$4,171	$0	780	129.920	0.0	$0.00	100%	2	2	2	0	0	0
Efficient New Home Construction	AC Rewards-DR	0	$0	$0	0	0.000	0.0	$0.00	100%	0	0	0	0	0	0
Efficient New Home Construction	AC Rewards-EE	0	$0	$0	0	0.000	0.0	$0.00	100%	0	0	0	0	0	0
Efficient New Home Construction	Aerators - EWH	10	$1	$1	82	0.012	0.0	$14.75	100%	50	50	50	50	50	50
Efficient New Home Construction	Aerators - GWH	10	$1	$1	0	0.000	0.4	$14.75	100%	100	100	100	100	100	100
Efficient New Home Construction	ENERGY STAR Clothes Dryer	12	$40	$75	98	0.350	0.0	$0.00	100%	340	340	340	340	340	340
Efficient New Home Construction	ENERGY STAR Clothes Washer	11	$24	$50	130	0.438	0.9	$0.00	100%	250	250	250	250	250	250
Efficient New Home Construction	ENERGY STAR Refrigerator	14	$15	$20	45	0.003	0.0	$0.00	100%	1,100	1,100	1,100	550	560	570
Efficient New Home Construction	ES Radon Fans	10	$20	$0	273	0.031	0.0	$0.00	100%	2	2	2	0	0	0
Efficient New Home Construction	New Homes	20	$443	$2,297	1,220	0.400	14.5	$0.00	100%	2,719	2,752	2,768	1,550	1,589	1,608
Efficient New Home Construction	New Homes - 100% Electric Homes	20	$1,750	$13,238	13,916	1.118	0.0	$0.00	100%	4	5	6	0	0	0
Efficient New Home Construction	Showerheads - EWH	10	$4	$4	427	0.031	0.0	$81.45	100%	50	50	50	50	50	50
Efficient New Home Construction	Showerheads - GWH	10	$4	$4	0	0.000	1.8	$81.45	100%	100	100	100	100	100	100
Efficient New Home Construction	Smart Thermostat	10	$125	$125	72	0.171	2.7	$0.00	100%	870	1,000	1,175	400	455	560
Efficient New Home Construction	Water Heater DR	1	$88	$271	152	0.071	0.0	$0.00	100%	0	10	60	0	0	0
EIS	Behavioral EIS	3	$1,860	$0	92,981	5.778	0.0	$0.00	100%	24	24	24	1	1	1
EIS	Business Saver's Switch	0	$0	$0	0	0.000	0.0	$0.00	100%	0	0	0	0	0	0
EIS	Custom EIS Project	16	$13,157	$26,308	200,621	29.239	0.0	$0.00	100%	3	3	3	1	1	1
EIS	Peak Partner Rewards	0	$0	$0	0	0.000	0.0	$0.00	100%	0	0	0	0	0	0
EIS	RCx Impelementation	7	$6,303	$24,001	197,023	6.159	534.4	$623.93	100%	2	2	2	20	70	70
Electric Rate Savings	Electric Rate Savings	5	$0	$0	329	164.289	0.0	$0.00	100%	36	36	36	0	0	0
Energy Efficient Showerhead	Aerators - EWH	10	$1	$1	68	0.010	0.0	$12.20	34%	3,570	3,570	3,570	0	0	0
Energy Efficient Showerhead	Aerators - GWH	10	$1	$1	0	0.000	0.3	$12.20	34%	0	0	0	30,100	30,100	30,100
Energy Efficient Showerhead	Showerheads - EWH	10	$3	$3	439	0.032	0.0	$83.76	64%	2,270	2,270	2,270	0	0	0
Energy Efficient Showerhead	Showerheads - GWH	10	$3	$3	0	0.000	1.9	$83.35	64%	0	0	0	19,300	19,300	19,300
Foodservice Equipment	AC Rewards - Business	10	$175	$175	196	1.041	3.9	$0.00	100%	2	2	2	0	0	0
Foodservice Equipment	Business Saver's Switch	15	$0	$0	2	1.460	0.0	$0.00	100%	1	2	2	0	0	0
Foodservice Equipment	Demand Control Ventilation	20	$751	$3,738	9,218	1.379	50.2	$0.00	100%	38	39	40	38	39	39
Foodservice Equipment	Dishwasher Combo	14	$207	$565	4,556	0.593	25.1	$533.89	100%	6	7	8	6	7	7
Foodservice Equipment	Dishwasher Electric	14	$131	$551	8,943	1.165	0.0	$143.91	100%	15	18	21	0	0	0
Foodservice Equipment	Dishwasher Gas	10	$250	$73	0	0.000	9.4	$54.15	100%	0	0	0	3	3	3
Foodservice Equipment	Food Service	12	$496	$2,838	0	0.000	102.0	$0.00	100%	0	0	0	75	89	89
Foodservice Equipment	Food Service Electric	12	$400	$1,713	2,073	0.324	0.0	$0.00	100%	1	1	1	0	0	0
Foodservice Equipment	Steam Cooker	12	$430	$2,270	0	0.000	107.3	$329.06	100%	0	0	0	0	4	4
Home Energy Insights	Behavioral Residential	3	$0	$0	24	0.007	0.1	$0.00	100%	650,000	730,000	780,000	328,000	322,000	322,000
Home Energy Insights	High Bill Alerts	1	$0	$0	28	0.000	0.4	$0.00	100%	100,000	100,000	100,000	60,000	60,000	60,000
Home Energy Savings Program	Advanced Power Strip	7	$20	$20	68	0.009	0.0	$0.00	75%	292	292	292	0	0	0
Home Energy Savings Program	Aerators - EWH	10	$5	$5	79	0.011	0.0	$13.84	100%	7	7	7	0	0	0
Home Energy Savings Program	Aerators - GWH	10	$5	$5	0	0.000	0.4	$15.08	100%	0	0	0	490	490	490
Home Energy Savings Program	Air Sealing - Electric Heating and Cooling	10	$402	$402	2,707	0.080	0.0	$0.00	100%	1	1	1	0	0	0
Home Energy Savings Program	Air Sealing - Electric Heating Only	10	$402	$402	4,693	0.000	0.0	$0.00	100%	1	1	1	0	0	0
Home Energy Savings Program	Air Sealing - Gas Heating / Electric Cooling	10	$402	$402	53	0.102	14.9	$0.00	100%	0	0	0	101	102	103
Home Energy Savings Program	Air Sealing - Gas Heating Only	10	$402	$402	0	0.000	17.3	$0.00	100%	0	0	0	1	31	32
Home Energy Savings Program	Attic Insulation - Electric Heating and Cooling	20	$2,057	$2,057	1,206	0.053	0.0	$0.00	100%	1	1	1	0	0	0
Home Energy Savings Program	Attic Insulation - Electric Heating Only	20	$2,661	$2,661	1,754	0.000	0.0	$0.00	100%	1	1	1	0	0	0
Home Energy Savings Program	Attic Insulation - Gas Heating / Electric Cooling	20	$2,771	$2,771	35	0.068	7.1	$0.00	100%	0	0	0	100	101	102
Home Energy Savings Program	Attic Insulation - Gas Heating Only	20	$2,629	$2,629	0	0.000	6.3	$0.00	100%	0	0	0	28	28	28
Home Energy Savings Program	Boiler	20	$8,855	$8,855	0	0.000	13.4	$0.00	100%	0	0	0	10	12	12
Home Energy Savings Program	ECM Furnace Fan	7	$845	$845	532	0.128	0.0	-$9.50	100%	15	15	15	0	0	0
Home Energy Savings Program	ENERGY STAR Refrigerator	13	$581	$581	44	0.003	0.0	$0.00	100%	699	699	699	0	0	0
Home Energy Savings Program	Furnace	18	$3,919	$3,919	0	0.000	10.9	$0.00	100%	0	0	0	86	86	87
Home Energy Savings Program	Home Lighting DI	20	$5	$5	28	0.004	0.0	$0.00	100%	12,528	12,528	12,528	0	0	0
Home Energy Savings Program	HP Water Heater	10	$3,778	$3,778	1,856	0.267	0.0	-$2.48	100%	19	19	19	0	0	0
Home Energy Savings Program	Mini-Split Heat Pump	15	$6,855	$6,855	2,413	0.881	0.0	$0.00	100%	2	2	2	0	0	0
Home Energy Savings Program	Refrigerator Recycling	7	$75	$75	822	0.094	0.0	$0.00	100%	2	2	2	0	0	0
Home Energy Savings Program	Res ASHP	18	$9,942	$9,942	4,498	0.211	0.0	$0.00	100%	3	3	3	0	0	0
Home Energy Savings Program	Residential Boiler Tune Up	2	$306	$306	0	0.000	5.0	$0.00	100%	0	0	0	14	14	15
Home Energy Savings Program	Residential Furnace Tune Up	2	$270	$270	0	0.000	3.1	$0.00	100%	0	0	0	29	29	29
Home Energy Savings Program	Room Air Conditioner Recycling	5	$50	$50	520	0.751	0.0	$0.00	100%	2	2	2	0	0	0
Home Energy Savings Program	Saver's Switch	15	$10	$10	1	0.748	0.0	$0.00	100%	44	45	47	0	0	0
Home Energy Savings Program	Showerheads - EWH	10	$31	$31	427	0.031	0.0	$81.45	100%	4	4	4	0	0	0
Home Energy Savings Program	Showerheads - GWH	10	$21	$21	0	0.000	2.2	$96.35	100%	1	1	1	251	262	274
Home Energy Savings Program	Smart Thermostat	10	$125	$125	76	0.180	5.5	$0.00	100%	0	0	0	18	18	18
Home Energy Savings Program	Wall AC	9	$728	$728	49	0.071	0.0	$0.00	100%	137	137	137	0	0	0
Home Energy Savings Program	Wall Insulation - Electric Heating and Cooling	20	$2,089	$2,089	7,216	0.287	0.0	$0.00	100%	1	1	1	0	0	0
Home Energy Savings Program	Wall Insulation - Electric Heating Only	20	$2,089	$2,089	6,867	0.000	0.0	$0.00	100%	1	1	1	0	0	0
Home Energy Savings Program	Wall Insulation - Gas Heating / Electric Cooling	20	$2,071	$2,071	132	0.254	26.8	$0.00	100%	0	0	0	28	28	29

Program	Measure Group	Measure Lifetime (years)	Rebate Amount ($)	Incremental Cost ($)	Annual Customer kWh Savings (kWh/yr)	Annual Customer Peak Coincident Demand Savings (PCkW)	Gas Savings (Dth)	Non-Energy O&M Savings ($)	Install Rate (%)	2021 Electric Units	2022 Electric Units	2023 Electric Units	2021 Gas Units	2022 Gas Units	2023 Gas Units
Home Energy Savings Program	Wall Insulation - Gas Heating Only	20	$2,457	$2,457	0	0.000	33.7	$0.00	100%	0	0	0	13	13	13
Home Energy Savings Program	Water Heater	13	$1,716	$1,716	0	0.000	1.9	$0.00	100%	0	0	0	192	192	192
Home Energy Savings Program	Weatherstripping - Electric Heating and Cooling	10	$32	$32	322	0.012	0.0	$0.00	100%	1	1	1	0	0	0
Home Energy Savings Program	Weatherstripping - Electric Heating Only	10	$32	$32	316	0.000	0.0	$0.00	100%	1	1	1	0	0	0
Home Energy Savings Program	Weatherstripping - Gas Heating / Electric Cooling	10	$32	$32	6	0.012	1.8	$0.00	100%	0	0	0	214	214	214
Home Energy Savings Program	Weatherstripping - Gas Heating Only	10	$32	$32	0	0.000	1.8	$0.00	100%	0	0	0	1	1	1
Home Energy Savings Program	Window AC	9	$628	$628	45	0.066	0.0	$0.00	100%	440	440	440	0	0	0
Home Energy Squad	AC Rewards-DR	5	$25	$25	2	1.109	0.0	$0.00	100%	541	761	1,027	0	0	0
Home Energy Squad	AC Rewards-EE	10	$125	$125	145	0.180	2.1	$0.00	100%	541	761	1,027	208	292	394
Home Energy Squad	Advanced Power Strip	7	$25	$25	68	0.009	0.0	$0.00	100%	0	50	100	0	0	0
Home Energy Squad	Aerators - EWH	10	$1	$1	88	0.012	0.0	$16.35	100%	1,234	1,388	1,562	0	0	0
Home Energy Squad	Aerators - GWH	10	$1	$1	0	0.000	0.4	$16.42	100%	0	0	0	4,500	5,063	5,696
Home Energy Squad	ENERGY STAR Dehumidifier	12	$35	$34	196	0.121	0.0	$0.00	100%	50	75	75	0	0	0
Home Energy Squad	Home Energy Squad Service	0	$0	$70	0	0.000	0.0	$0.00	100%	8,133	9,149	10,293	2,988	3,362	3,782
Home Energy Squad	Home Lighting DI	19	$3	$3	30	0.004	0.0	$0.00	100%	212,625	239,203	269,104	0	0	0
Home Energy Squad	Programmable Thermostat	10	$19	$19	79	0.112	8.3	$0.00	100%	1,582	1,780	1,537	633	712	799
Home Energy Squad	Saver's Switch	15	$90	$90	1	0.748	0.0	$0.00	100%	10	15	20	0	0	0
Home Energy Squad	Showerheads - EWH	10	$6	$6	457	0.033	0.0	$87.01	100%	815	918	1,032	0	0	0
Home Energy Squad	Showerheads - GWH	10	$6	$6	0	0.000	2.0	$87.45	100%	0	0	0	3,327	3,744	4,212
Home Energy Squad	Smart Thermostat	10	$50	$125	105	0.163	2.4	$0.00	100%	60	85	114	29	41	55
Home Energy Squad	Water Heater DR	1	$100	$200	1	0.213	0.0	$0.00	100%	5	10	20	0	0	0
Home Energy Squad	Water Heater Setback	8	$0	$0	17	0.001	0.4	$0.00	100%	69	78	88	578	650	732
Home Energy Squad	Weatherstripping - Electric Heating and Cooling	10	$11	$12	322	0.012	0.0	$0.00	100%	125	141	159	0	0	0
Home Energy Squad	Weatherstripping - Electric Heating Only	10	$11	$12	316	0.000	0.0	$0.00	100%	25	28	32	0	0	0
Home Energy Squad	Weatherstripping - Gas Heating / Electric Cooling	10	$11	$12	6	0.012	1.8	$0.00	100%	4,806	5,407	6,083	1,902	2,140	2,408
Home Energy Squad	Weatherstripping - Gas Heating Only	10	$11	$12	0	0.000	1.8	$0.00	100%	0	0	0	50	56	64
Home Lighting	Residential Home Lighting - Business Customers	5	$2	$7	160	0.024	0.0	$0.00	100%	272,321	268,778	267,705	0	0	0
Home Lighting	Residential Home Lighting - Residential Customers	20	$1	$2	39	0.005	0.0	$0.00	99%	2,755,694	2,661,696	2,571,957	0	0	0
HVACR	AC Rewards - Business	10	$134	$134	332	0.991	0.4	$0.00	100%	21	21	21	0	0	0
HVACR	Aerators	8	$20	$20	109	0.000	3.4	$167.02	100%	6	6	6	45	45	45
HVACR	Anti-Sweat Heater Controls	12	$60	$180	1,415	0.146	0.0	$0.00	100%	20	20	20	10	10	10
HVACR	Assessment	0	$3,000	$3,000	0	0.000	0.0	$0.00	100%	15	15	15	0	0	0
HVACR	Boiler	20	$8,775	$18,004	0	0.000	548.8	$0.00	100%	0	0	0	73	73	73
HVACR	Boiler Controls	18	$1,387	$11,744	0	0.000	405.0	$0.00	100%	0	0	0	44	44	44
HVACR	Boiler Tune Up	2	$137	$547	0	0.000	96.7	$0.00	100%	0	0	0	320	320	320
HVACR	Business Saver's Switch	15	$0	$0	2	1.519	0.0	$0.00	100%	33	33	33	0	0	0
HVACR	Chiller	20	$6,312	$18,102	35,911	16.461	0.0	$0.00	100%	50	50	50	0	0	0
HVACR	Chiller VFD	15	$11,537	$41,887	495,199	-0.304	0.0	$0.00	100%	3	3	3	0	0	0
HVACR	Custom Cooling Project	18	$8,844	$58,559	93,404	19.134	0.0	$1.67	100%	4	4	4	0	0	0
HVACR	Custom Heating Project	18	$664	$6,613	0	0.000	132.8	$0.00	100%	0	0	0	2	2	2
HVACR	Custom Motors Project	17	$6,751	$28,584	74,886	13.571	0.0	$0.00	100%	2	2	2	0	0	0
HVACR	Custom Refrigeration Project	16	$12,258	$71,019	154,882	24.504	0.0	$7,781.69	100%	6	6	6	0	0	0
HVACR	Destratification Fans	15	$2,000	$7,320	0	0.000	87.8	$0.00	100%	0	0	0	10	10	10
HVACR	DX	20	$1,272	$1,262	4,726	1.389	0.0	$0.00	100%	312	312	312	0	0	0
HVACR	Evaporator Fan Motor Controller	15	$35	$351	362	0.042	0.0	$0.00	100%	20	20	20	0	0	0
HVACR	Fan Efficiency (FEI)	16	$1,232	$3,014	15,462	2.119	0.0	$0.00	100%	348	348	348	0	0	0
HVACR	Floating Head Pressure Controls	15	$2,511	$4,185	85,563	0.000	0.0	$0.00	100%	10	10	10	0	0	0
HVACR	Fractional HP Circ. Pumps	15	$80	$194	3,488	0.623	0.0	$0.00	100%	68	68	68	0	0	0
HVACR	Fractional HP Fan Motors	15	$76	$191	680	0.233	0.0	$0.00	100%	43	43	43	0	0	0
HVACR	Furnace	20	$264	$1,455	0	0.000	16.7	$0.00	100%	0	0	0	7	7	7
HVACR	In-Depth Study	0	$13,576	$19,830	0	0.000	0.0	$0.00	100%	3	3	3	2	2	2
HVACR	Medium-temp Enclosed Reach-In Case	15	$70	$447	970	0.111	0.0	$0.00	100%	32	32	32	0	0	0
HVACR	Mini Split	0	$227	$512	0	0.000	0.0	$0.00	100%	20	20	20	0	0	0
HVACR	MN ERV	15	$5,041	$1,451	5,017	12.106	866.5	$0.00	100%	3	3	3	2	2	2
HVACR	Motors	17	$282	$1,650	841	0.131	0.0	$0.00	100%	48	48	48	0	0	0
HVACR	No Heat Case Doors	12	$125	$538	1,572	0.180	0.0	$0.00	100%	20	20	20	0	0	0
HVACR	Ozone Laundry	10	$3,028	$10,804	0	0.000	82.0	$1,272.23	100%	0	0	0	2	2	2
HVACR	Pipe Insulation	13	$1,212	$2,626	0	0.000	81.5	$0.00	100%	0	0	0	5	5	5
HVACR	Pump Efficiency (PEI)	16	$1,386	$3,267	36,950	6.737	0.0	$0.00	100%	235	235	235	0	0	0
HVACR	Refigeration Fans	15	$54	$189	598	0.068	0.0	$0.00	100%	70	70	70	0	0	0
HVACR	Retrofit of open multi-deck cases with solid glass doors	12	$116	$498	842	0.096	7.2	$0.00	100%	32	32	32	0	0	0
HVACR	Retrofit Refrigerated	20	$45	$164	682	0.081	0.0	$0.00	100%	10	10	10	0	0	0
HVACR	Steam Traps	5	$50	$287	0	0.000	64.1	$0.00	100%	0	0	0	122	122	122
HVACR	Unit Heater	20	$128	$766	0	0.000	20.2	$0.00	100%	0	0	0	2	2	2
HVACR	Unit Heater Infrared	15	$186	$227	1,870	0.000	84.7	$0.00	100%	1	1	1	2	2	2
HVACR	VFDs	15	$1,643	$5,008	23,293	3.656	0.0	$0.00	100%	129	129	129	0	0	0
HVACR	Walk-in Freezer Defrost Controls	15	$319	$1,351	3,368	0.385	0.0	$0.00	100%	10	10	10	0	0	0
HVACR	Water Heater	18	$962	$3,977	0	0.000	116.2	-$400.00	100%	0	0	0	2	2	2
HVACR	Well Pump VFD	15	$923	$7,396	32,406	4.353	0.0	$0.00	100%	45	45	45	0	0	0
HVACR	WSHP	20	$242	$422	379	0.392	0.0	$0.00	100%	23	23	23	0	0	0
Insulation Rebates	AC Rewards-DR	5	$190	$190	2	1.109	0.0	$0.00	100%	20	20	20	0	0	0
Insulation Rebates	AC Rewards-EE	10	$110	$110	123	0.236	9.5	$0.00	100%	25	25	25	0	0	0
Insulation Rebates	Air Sealing - Electric Heating and Cooling	10	$150	$929	5,191	0.170	0.0	$0.00	100%	5	5	5	0	0	0
Insulation Rebates	Air Sealing - Electric Heating Only	10	$150	$500	1,993	0.000	0.0	$0.00	100%	5	5	5	0	0	0
Insulation Rebates	Air Sealing - Gas Heating / Electric Cooling	10	$101	$1,082	90	0.174	25.7	$0.00	100%	650	650	650	475	475	475
Insulation Rebates	Air Sealing - Gas Heating Only	10	$146	$1,786	0	0.000	27.3	$0.00	100%	0	0	0	25	25	25
Insulation Rebates	Attic Insulation - Electric Heating and Cooling	20	$315	$1,935	1,858	0.082	0.0	$0.00	100%	5	5	5	0	0	0
Insulation Rebates	Attic Insulation - Electric Heating Only	20	$315	$1,935	1,801	0.000	0.0	$0.00	100%	5	5	5	0	0	0
Insulation Rebates	Attic Insulation - Gas Heating / Electric Cooling	20	$233	$2,229	56	0.108	11.4	$0.00	100%	600	600	600	425	425	425

Program	Measure Group	Measure Lifetime (years)	Rebate Amount ($)	Incremental Cost ($)	Annual Customer kWh Savings (kWh/yr)	Annual Customer Peak Coincident Demand Savings (PCkW)	Gas Savings (Dth)	Non-Energy O&M Savings ($)	Install Rate (%)	2021 Electric Units	2022 Electric Units	2023 Electric Units	2021 Gas Units	2022 Gas Units	2023 Gas Units
Insulation Rebates	Attic Insulation - Gas Heating Only	20	$323	$1,488	0	0.000	8.4	$0.00	100%	0	0	0	25	25	25
Insulation Rebates	Wall Insulation - Electric Heating and Cooling	20	$300	$2,611	7,216	0.287	0.0	$0.00	100%	3	3	3	0	0	0
Insulation Rebates	Wall Insulation - Electric Heating Only	20	$300	$3,249	6,867	0.000	0.0	$0.00	100%	3	3	3	0	0	0
Insulation Rebates	Wall Insulation - Gas Heating / Electric Cooling	20	$198	$3,351	186	0.357	37.5	$0.00	100%	60	60	60	43	43	43
Insulation Rebates	Wall Insulation - Gas Heating Only	20	$291	$2,830	0	0.000	45.0	$0.00	100%	0	0	0	3	3	3
Lighting	Custom Lighting Project	17	$7,024	$35,246	99,192	12.066	0.0	-$78.56	100%	230	230	230	0	0	0
Lighting	Lighting Controls	8	$6	$34	81	0.015	0.0	-$0.04	100%	15,000	15,000	15,000	0	0	0
Lighting	Lighting Redesign	20	$17,483	$49,154	54,078	3.992	0.0	$0.00	100%	12	12	12	0	0	0
Lighting	Midstream High Bay	0	$0	$0	0	0.000	0.0	$0.00	100%	0	0	0	0	0	0
Lighting	Midstream Screw In	4	$4	$3	137	0.023	0.0	-$0.59	100%	106,614	106,614	106,614	0	0	0
Lighting	Midstream Troffer	0	$0	$0	0	0.000	0.0	$0.00	100%	0	0	0	0	0	0
Lighting	Midstream Tube	0	$0	$0	0	0.000	0.0	$0.00	100%	0	0	0	0	0	0
Lighting	Networked Lighting Controls	15	$34	$135	202	0.037	0.0	-$0.10	100%	16,000	18,000	20,000	0	0	0
Lighting	New Construction Exterior	20	$45	$250	1,609	0.000	0.0	$0.00	100%	1,799	1,799	1,799	0	0	0
Lighting	New Construction Flat	20	$29	$104	1,624	0.185	0.0	$0.00	100%	215	215	208	0	0	0
Lighting	New Construction High Bay	20	$85	$211	1,172	0.207	0.0	-$4.96	100%	5,724	5,724	5,724	0	0	0
Lighting	New Construction Refrigerated	20	$35	$87	412	0.069	0.0	$0.00	100%	234	234	234	0	0	0
Lighting	New Construction Troffer	20	$28	$63	196	0.033	0.0	-$0.45	100%	28,921	28,921	28,921	0	0	0
Lighting	Retrofit Exterior	20	$40	$426	1,428	0.000	0.0	$0.00	100%	7,811	7,343	7,343	0	0	0
Lighting	Retrofit Flat	20	$78	$276	1,069	0.124	0.0	-$0.36	100%	4,653	4,853	5,052	0	0	0
Lighting	Retrofit High Bay	19	$83	$381	892	0.156	0.0	-$3.53	100%	16,275	15,865	14,739	0	0	0
Lighting	Retrofit Refrigerated	20	$45	$164	682	0.081	0.0	$0.00	100%	281	281	281	0	0	0
Lighting	Retrofit Troffer	20	$29	$132	298	0.056	0.0	-$0.54	100%	74,749	64,749	62,238	0	0	0
Lighting	Retrofit Tube	11	$3	$13	81	0.015	0.0	-$0.34	100%	377,330	337,330	337,330	0	0	0
Low Income Home Energy Squad	AC Rewards-DR	5	$190	$190	2	1.109	0.0	$0.00	100%	202	284	383	0	0	0
Low Income Home Energy Squad	AC Rewards-EE	10	$110	$110	76	0.180	5.5	$0.00	100%	202	284	383	81	114	153
Low Income Home Energy Squad	Advanced Power Strip	7	$15	$15	68	0.009	0.0	$0.00	100%	5	10	15	0	0	0
Low Income Home Energy Squad	Aerators - EWH	10	$1	$1	84	0.012	0.0	$15.36	100%	326	368	413	0	0	0
Low Income Home Energy Squad	Aerators - GWH	10	$1	$1	0	0.000	0.4	$15.44	100%	0	0	0	1,434	1,613	1,816
Low Income Home Energy Squad	Home Energy Squad Service	0	$70	$70	0	0.000	0.0	$0.00	100%	1,594	1,350	1,793	672	788	756
Low Income Home Energy Squad	Home Lighting DI	19	$3	$3	28	0.004	0.0	$0.00	100%	24,636	27,716	31,181	0	0	0
Low Income Home Energy Squad	Programmable Thermostat	10	$23	$23	77	0.109	3.4	$0.00	100%	495	492	481	209	208	204
Low Income Home Energy Squad	Saver's Switch	15	$90	$90	1	0.748	0.0	$0.00	100%	10	15	20	0	0	0
Low Income Home Energy Squad	Showerheads - EWH	10	$6	$6	471	0.034	0.0	$89.80	100%	200	225	252	0	0	0
Low Income Home Energy Squad	Showerheads - GWH	10	$6	$6	0	0.000	2.0	$91.37	100%	0	0	0	911	1,025	1,153
Low Income Home Energy Squad	Smart Thermostat	10	$125	$125	76	0.180	2.2	$0.00	100%	22	32	43	9	13	17
Low Income Home Energy Squad	Water Heater DR	1	$100	$200	1	0.213	0.0	$0.00	100%	5	10	15	0	0	0
Low Income Home Energy Squad	Water Heater Setback	8	$0	$0	17	0.001	0.4	$0.00	100%	27	30	34	222	250	282
Low Income Home Energy Squad	Weatherstripping - Electric Heating and Cooling	10	$12	$12	322	0.012	0.0	$0.00	100%	25	28	31	0	0	0
Low Income Home Energy Squad	Weatherstripping - Electric Heating Only	10	$12	$12	316	0.000	0.0	$0.00	100%	5	6	6	0	0	0
Low Income Home Energy Squad	Weatherstripping - Gas Heating / Electric Cooling	10	$12	$12	6	0.012	1.8	$0.00	100%	942	1,059	1,192	373	419	472
Low Income Home Energy Squad	Weatherstripping - Gas Heating Only	10	$12	$12	0	0.000	1.8	$0.00	100%	0	0	0	10	12	12
Low Income Multi-Family	Advanced Power Strip	7	$20	$20	68	0.009	0.0	$0.00	75%	656	689	724	0	0	0
Low Income Multi-Family	ENERGY STAR Refrigerator	14	$680	$653	45	0.003	0.0	$0.00	100%	523	528	554	0	0	0
Low Income Multi-Family	Home Lighting DI	20	$5	$5	22	0.003	0.0	$0.00	100%	3,647	3,727	3,913	0	0	0
Low Income Multi-Family	Mini-Split Heat Pump	15	$6,855	$6,855	2,093	0.881	0.0	$0.00	100%	4	5	5	0	0	0
Low Income Multi-Family	Refrigerator Recycling	7	$41	$41	822	0.094	0.0	$0.00	100%	2	2	2	0	0	0
Low Income Multi-Family	Room Air Conditioner Recycling	5	$41	$41	617	0.751	0.0	$0.00	100%	2	2	2	0	0	0
Low Income Multi-Family	Wall AC	9	$578	$578	58	0.071	0.0	$0.00	100%	625	631	663	0	0	0
Low Income Multi-Family	Window AC	9	$392	$392	54	0.066	0.0	$0.00	100%	16	16	17	0	0	0
Multi-Family Building Efficiency	Advanced Power Strip	7	$18	$18	68	0.009	0.0	$0.00	75%	5,000	5,100	5,253	0	0	0
Multi-Family Building Efficiency	Aerators - EWH	10	$3	$3	97	0.014	0.0	$17.48	100%	248	251	259	0	0	0
Multi-Family Building Efficiency	Aerators - GWH	10	$3	$3	0	0.000	0.4	$18.01	100%	0	0	0	3,743	4,001	4,001
Multi-Family Building Efficiency	Business Saver's Switch	15	$0	$0	2	1.198	0.0	$0.00	100%	54	57	60	0	0	0
Multi-Family Building Efficiency	Custom Electric Multi-Family Building Efficiency Project	18	$162	$1,161	1,766	0.330	0.0	$0.00	100%	400	400	400	0	0	0
Multi-Family Building Efficiency	Custom Gas Multi-Family Building Efficiency Project	19	$149	$2,124	0	0.000	29.7	$0.00	100%	0	0	0	75	85	85
Multi-Family Building Efficiency	Home Lighting DI	20	$8	$8	30	0.004	0.0	$0.00	100%	50,400	51,400	52,420	0	0	0
Multi-Family Building Efficiency	Lighting DI	6	$6	$6	218	0.036	0.0	$0.00	100%	1,635	1,749	1,802	0	0	0
Multi-Family Building Efficiency	Multi-Family Bundles	19	$3,528	$19,602	8,283	0.828	20.9	-$16.39	100%	7	4	0	6	5	5
Multi-Family Building Efficiency	Multi-Family Prescriptive	10	$46	$90	122	0.024	2.6	$0.00	100%	4,822	4,920	4,926	100	130	130
Multi-Family Building Efficiency	Renter Kit Window Film - Gas Heating Only	1	$0	$0	0	0.000	0.1	$0.00	100%	0	0	0	5	5	5
Multi-Family Building Efficiency	Showerheads - EWH	10	$8	$8	594	0.043	0.0	$113.30	100%	101	102	106	0	0	0
Multi-Family Building Efficiency	Showerheads - GWH	10	$7	$7	0	0.000	2.6	$115.06	100%	0	0	0	1,457	1,557	1,557
Multi-Family Building Efficiency	Water Heater Setback	2	$0	$0	519	0.059	23.2	$0.00	100%	5	5	5	39	42	42
Multi-Family Building Efficiency	Weatherstripping - Electric Heating and Cooling	10	$30	$30	322	0.012	0.0	$0.00	100%	38	40	41	0	0	0
Multi-Family Building Efficiency	Weatherstripping - Electric Heating Only	10	$30	$30	316	0.000	0.0	$0.00	100%	1	1	1	0	0	0
Multi-Family Building Efficiency	Weatherstripping - Gas Heating / Electric Cooling	10	$30	$30	6	0.012	1.8	$0.00	100%	0	0	0	21	22	22
Multi-Family Building Efficiency	Weatherstripping - Gas Heating Only	10	$30	$30	0	0.000	1.8	$0.00	100%	0	0	0	1	1	1
Peak Partner Rewards	Peak Partner Rewards	1	$28,418	$0	5,312	885.294	0.0	$0.00	100%	30	45	60	0	0	0
Process Efficiency	Behavioral Process	3	$1,860	$0	92,981	5.778	0.0	$0.00	100%	1	1	1	0	0	0
Process Efficiency	Business Saver's Switch	15	$0	$0	2	1.242	0.0	$0.00	100%	1	1	3	0	0	0
Process Efficiency	Custom Electric Process Efficiency Project	18	$14,853	$177,225	339,894	68.557	0.0	$41,231.94	100%	105	105	105	0	0	0

Program	Measure Group	Measure Lifetime (years)	Rebate Amount ($)	Incremental Cost ($)	Annual Customer kWh Savings (kWh/yr)	Annual Customer Peak Coincident Demand Savings (PCkW)	Gas Savings (Dth)	Non-Energy O&M Savings ($)	Install Rate (%)	2021 Electric Units	2022 Electric Units	2023 Electric Units	2021 Gas Units	2022 Gas Units	2023 Gas Units
Process Efficiency	Custom Gas Process Efficiency Project	12	$43,277	$227,593	0	0.000	12,876.1	$11,577.24	100%	0	0	0	17	17	17
Process Efficiency	EDA	20	$42,788	$191,705	274,597	61.337	503.5	-$78.63	100%	3	3	3	2	1	1
Process Efficiency	EEB	20	$7,677	$15,819	32,699	8.519	27.7	-$115.51	100%	3	3	3	1	1	1
Process Efficiency	Electric Rate Savings	5	$0	$0	329	164.289	0.0	$0.00	100%	1	2	2	0	0	0
Process Efficiency	PE Bonuses	0	$36,680	$0	0	0.000	0.0	$0.00	100%	8	9	10	2	2	2
Process Efficiency	Peak Partner Rewards	1	$15,356	$0	2,870	478.400	0.0	$0.00	100%	1	2	3	0	0	0
Process Efficiency	Process Efficiency Prescriptive	17	$8,429	$22,846	111,108	15.433	22.4	-$262.96	100%	229	236	243	25	25	25
Process Efficiency	Process Efficiency Study	0	$15,629	$16,355	0	0.000	0.0	$0.00	100%	1	1	1	0	1	1
Process Efficiency	RCx Impelementation	7	$8,956	$22,384	310,434	9.334	0.0	$0.00	100%	7	8	9	0	0	0
Refrigerator Recycling	Dehumidifier Recycling	5	$0	$0	770	0.357	0.0	$0.00	100%	150	175	200	0	0	0
Refrigerator Recycling	Refrigerator Recycling	7	$50	$0	827	0.095	0.0	$0.00	100%	6,900	6,800	6,700	0	0	0
Refrigerator Recycling	Room Air Conditioner Recycling	5	$0	$0	542	0.781	0.0	$0.00	100%	75	100	125	0	0	0
Refrigerator Recycling	Saver's Switch	15	$90	$90	1	0.748	0.0	$0.00	100%	100	150	200	0	0	0
Residential Demand Response	AC Rewards-DR	5	$136	$100	2	1.101	0.0	$0.00	100%	6,365	6,365	6,365	0	0	0
Residential Demand Response	AC Rewards-EE	10	$110	$110	75	0.177	5.4	$0.00	100%	3,115	3,115	3,115	3,115	3,115	3,115
Residential Demand Response	Saver's Switch	15	$0	$0	1	0.744	0.0	$0.00	100%	15,100	15,100	15,100	0	0	0
Residential Demand Response	Smart Thermostat	10	$47	$0	87	0.143	5.4	$0.00	100%	1,945	1,945	1,945	2,380	2,380	2,380
Residential Demand Response	Water Heater DR	1	$50	$108	152	0.071	0.0	$0.00	100%	50	100	150	0	0	0
Residential HVAC	AC Rewards-DR	5	$158	$203	2	1.109	0.0	$0.00	100%	100	100	100	50	50	50
Residential HVAC	AC Rewards-EE	10	$110	$110	76	0.180	5.5	$0.00	100%	100	100	100	100	100	100
Residential HVAC	Boiler	20	$400	$1,422	0	0.000	13.4	$0.00	100%	0	0	0	320	320	320
Residential HVAC	Furnace	18	$309	$938	0	0.000	11.6	$0.00	100%	0	0	0	6,360	6,360	6,360
Residential HVAC	HP Water Heater	10	$440	$784	2,527	0.335	0.0	-$0.89	100%	88	88	88	15	15	15
Residential HVAC	Mini-Split Heat Pump	15	$364	$2,050	1,499	0.881	0.0	$0.00	100%	700	700	0	0	0	700
Residential HVAC	Res AC	18	$290	$525	262	0.483	0.0	$0.00	100%	4,500	4,500	4,500	0	0	0
Residential HVAC	Res AC w/ Furnace	18	$203	$377	179	0.318	3.3	$0.00	100%	12,600	12,600	12,600	11,970	11,970	11,970
Residential HVAC	Res ASHP	18	$357	$689	3,818	0.409	0.0	$0.00	100%	145	145	145	0	0	0
Residential HVAC	Res ASHP - Cooling only	18	$207	$410	121	0.092	0.0	$0.00	100%	175	175	175	0	0	0
Residential HVAC	Res GSHP	20	$2,058	$14,396	7,657	0.918	82.9	$0.00	100%	230	230	230	130	130	130
Residential HVAC	Water Heater	16	$121	$352	0	0.000	4.4	$0.00	100%	2	2	2	855	855	855
Saver's Switch for Business	AC Rewards - Business	10	$178	$178	191	1.081	0.7	$0.00	100%	1,917	2,850	3,850	83	150	150
Saver's Switch for Business	Business Saver's Switch	15	$0	$0	1	1.117	0.0	$0.00	100%	2,100	2,100	2,100	0	0	0
Saver's Switch for Business	Commercial AC Switch	0	$0	$0	0	0.000	0.0	$0.00	100%	0	0	0	0	0	0
School Education Kits	Advanced Power Strip	7	$25	$25	68	0.009	0.0	$0.00	71%	2,500	5,000	7,500	0	0	0
School Education Kits	Aerators - EWH	10	$1	$1	83	0.012	0.0	$15.04	42%	7,260	7,560	7,860	0	0	0
School Education Kits	Aerators - GWH	10	$1	$1	0	0.000	0.4	$15.29	42%	0	0	0	26,840	29,040	31,240
School Education Kits	Home Lighting DI	20	$8	$8	33	0.004	0.0	$0.00	92%	58,000	58,000	58,000	0	0	0
School Education Kits	Programmable Thermostat	10	$0	$0	79	0.112	8.4	$0.00	40%	31,500	34,000	36,500	16,500	19,000	21,500
School Education Kits	Showerheads - EWH	10	$3	$3	511	0.037	0.0	$97.40	48%	3,780	4,080	4,380	0	0	0
School Education Kits	Showerheads - GWH	10	$3	$3	0	0.000	2.2	$97.40	48%	0	0	0	14,520	16,720	18,920
School Education Kits	Water Heater Setback	8	$0	$0	30	0.001	0.3	$0.00	40%	3,780	4,080	4,380	14,520	16,720	18,920
Self Direct	Custom Self-Direct Project	0	$0	$0	0	0.000	0.0	$0.00	100%	0	0	0	0	0	0
Whole Home Efficiency	AC Rewards-DR	5	$190	$190	2	1.109	0.0	$0.00	100%	5	5	6	5	5	6
Whole Home Efficiency	AC Rewards-EE	10	$110	$110	76	0.180	5.5	$0.00	100%	5	5	6	5	5	6
Whole Home Efficiency	Air Sealing - Electric Heating and Cooling	10	$1,239	$710	4,955	0.162	0.0	$0.00	100%	3	4	5	0	0	0
Whole Home Efficiency	Air Sealing - Electric Heating Only	10	$1,038	$710	4,153	0.000	0.0	$0.00	100%	1	1	2	0	0	0
Whole Home Efficiency	Air Sealing - Gas Heating / Electric Cooling	10	$278	$686	90	0.173	25.6	$0.00	100%	28	30	33	29	31	34
Whole Home Efficiency	Air Sealing - Gas Heating Only	10	$243	$710	0	0.000	24.3	$0.00	100%	8	9	10	8	9	10
Whole Home Efficiency	Attic Insulation - Electric Heating and Cooling	20	$465	$1,904	1,858	0.082	0.0	$0.00	100%	3	4	5	0	0	0
Whole Home Efficiency	Attic Insulation - Electric Heating Only	20	$439	$2,042	1,754	0.000	0.0	$0.00	100%	1	1	2	0	0	0
Whole Home Efficiency	Attic Insulation - Gas Heating / Electric Cooling	20	$85	$2,184	37	0.072	7.6	$0.00	100%	37	41	45	38	42	46
Whole Home Efficiency	Attic Insulation - Gas Heating Only	20	$75	$2,179	0	0.000	7.5	$0.00	100%	10	11	12	10	11	12
Whole Home Efficiency	Boiler	20	$400	$1,422	0	0.000	13.4	$0.00	100%	1	1	1	1	1	1
Whole Home Efficiency	ENERGY STAR Clothes Dryer	12	$40	$75	98	0.350	0.0	$0.00	100%	2	2	2	2	2	2
Whole Home Efficiency	ENERGY STAR Clothes Washer	11	$10	$50	244	0.828	1.3	$0.00	100%	4	4	4	4	4	4
Whole Home Efficiency	ENERGY STAR Dehumidifier	12	$35	$144	178	0.110	0.0	$0.00	100%	2	3	4	2	3	4
Whole Home Efficiency	ENERGY STAR Refrigerator	14	$15	$20	45	0.003	0.0	$0.00	100%	2	2	2	1	1	1
Whole Home Efficiency	Furnace	18	$300	$918	0	0.000	11.7	$0.00	100%	15	16	17	15	16	17
Whole Home Efficiency	HP Water Heater	10	$510	$784	2,953	0.337	0.0	-$19.66	100%	8	8	10	8	8	10
Whole Home Efficiency	Mini-Split Heat Pump	15	$600	$6,855	4,012	0.881	0.0	$0.00	100%	1	1	1	0	0	0
Whole Home Efficiency	Res AC	18	$317	$579	280	0.514	0.0	$0.00	100%	3	3	3	3	3	3
Whole Home Efficiency	Res AC w/ Furnace	18	$190	$347	168	0.308	3.4	$0.00	100%	5	5	5	5	5	5
Whole Home Efficiency	Smart Thermostat	10	$125	$125	76	0.180	5.5	$0.00	100%	5	5	6	5	5	6
Whole Home Efficiency	Wall Insulation - Electric Heating and Cooling	20	$1,350	$2,031	5,400	0.279	0.0	$0.00	100%	3	4	5	0	0	0
Whole Home Efficiency	Wall Insulation - Electric Heating Only	20	$1,314	$2,031	5,254	0.000	0.0	$0.00	100%	1	1	2	0	0	0
Whole Home Efficiency	Wall Insulation - Gas Heating / Electric Cooling	20	$329	$2,031	145	0.279	29.4	$0.00	100%	34	37	41	35	38	42
Whole Home Efficiency	Wall Insulation - Gas Heating Only	20	$294	$2,031	0	0.000	29.4	$0.00	100%	10	11	12	10	11	12
Whole Home Efficiency	Water Heater	15	$127	$226	0	0.000	3.1	$0.00	100%	10	10	11	12	12	13
Whole Home Efficiency	Water Heater DR	1	$53	$122	152	0.071	0.0	$0.00	100%	5	10	16	0	0	0

Deemed Savings Technical Assumptions

In this Plan, the Deemed Savings Technical Assumptions are organized by technology rather than program as in previous filings. In instances where a type of measure is offered by multiple programs, those are now presented together as a single calculation methodology rather than duplicated and represented separately. The following table summarizes section numbers for each technology category where the calculation methodology, inputs, and variables for each individual measure can be found:

Technology Category	Section
Appliances	1
Behavioral	2
Business New Construction	3
Commercial DR	4
Compressed Air	5
Computer Efficiency	6
Custom	7
Envelope	8
Holistic	9
Home Lighting	10
HVAC Cooling	11
HVAC Heating	12
Lighting	13
Motors	14
New Homes	15
Refrigeration	16
Residential HVAC	17
Study & Non-Achievement	18
Water Heaters	19

1.1 Dishwasher

Algorithms

$$Customer\ kW = Savings\ kW$$

$$Customer\ kWh = Savings\ kW\ \times Hours$$

$$PCkW = Savings\ kW\ \times CF$$

$$Customer\ Dth = Savings\ Dth$$

Variables

Savings kW	See Table 1.1.1.a	Kilowatt savings per unit installed.
Savings Dth	See Table 1.1.1.b	Decatherm savings per unit installed.
CF	See Table 1.2.1	Coincidence Factor
Hours	See Table 1.1.1.a	Annual Hours of Operation
Incremental costs	See Table 1.2.1	Difference in cost between the standard equipment and the more efficient equipment.
Measure Life	See Table 1.2.1	
O&M savings	See Table 1.2.1	

Customer Inputs	**M&V Verified**	
Primary water heating fuel	Yes	
Secondary water heating (booster water heat	Yes	
Model Name	Yes	
Model Number	Yes	
Quantity	Yes	
Size	Yes	

Table 1.1.1.a Pre and Post Retrofit Dishwasher Electric [1]

Post-retrofit technology	Savings kW	Hours (Baseline & Efficient)
Energy Star Rated Dishwasher: Electric Water Heating without Booster Heater (Low Temperature) - Ref 3		
Under Counter	0.387	6570
Door Type	2.459	6570
Energy Star Rated Dishwasher: Electric Water Heating with Electric Booster Heater (High Temperature) - Ref 3		
Under Counter	0.483	6570
Door Type	1.806	6570
Energy Star Rated Dishwasher: Electric Water Heating with Gas Booster Heater (High Temperature) - Ref 3		
Under Counter	0.389	6570
Door Type	1.195	6570
Energy Star Rated Dishwasher: Gas Water Heating with Electric Booster Heater (High Temperature)		
Under Counter	0.318	6570
Door Type	0.737	6570

Table 1.1.1.b Pre and Post Retrofit Dishwasher [1]

Post-retrofit Technology	Type	Dishwasher Dth/yr Savings
Energy Star Rated Dishwasher: Gas Water Heating without Booster Heater (Low Temperature)	Under Counter	10.62
	Door Type	67.53
Energy Star Rated Dishwasher: Gas Water Heating with Electric Booster Heater (High Temperature)	Under Counter	4.52
	Door Type	29.36
Energy Star Rated Dishwasher: Gas Water Heating with Gas Booster Heater (High Temperature) - Ref 3	Under Counter	7.11
	Door Type	46.14
Energy Star Rated Dishwasher: Electric Water Heating with Gas Booster Heater (High Temperature) - Ref 3	Under Counter	2.58
	Door Type	16.78

Table 1.2.1 Deemed Equipment Information [1]

	Incremental Cost	Measure Life (yrs)	Coincidence Factor (CF)	Non-Energy O&M Savings	Energy O&M Savings
Dishwasher: Electric Water Heating without Booster Heater (Low Temperature) - Ref 3					
Under Counter	$50.00	10	85.40%	$66.97	$0.00
Door Type	$0.00	15	85.40%	$425.95	$0.00
Dishwasher: Electric Water Heating with Electric Booster Heater (High Temperature) - Ref 3					
Under Counter	$120.00	10	85.40%	$28.52	$0.00
Door Type	$770.00	15	85.40%	$185.20	$0.00
Gas Booster Heater (High Temperature) -					
Under Counter	$120.00	10	85.40%	$28.52	$0.00
Door Type	$770.00	15	85.40%	$185.20	$0.00
Dishwasher: Gas Water Heating without Booster Heater (Low Temperature)					
Under Counter	$50.00	10	n/a	$66.97	$0.00
Door Type	$0.00	15	n/a	$425.95	$0.00
Dishwasher: Gas Water Heating with Electric Booster Heater (High Temperature)					
Under Counter	$120.00	10	n/a	$66.97	$0.00
Door Type	$770.00	15	n/a	$425.95	$0.00
Dishwasher: Gas Water Heating with Gas Booster Heater (High Temperature)					
Under Counter	$120.00	10	n/a	$7.64	$0.00
Door Type	$770.00	15	n/a	$67.61	$0.00

References:

1. ENERGY STAR

Changes from Recent Filing:

1.2 Food Service

Algorithms

$$Customer\ kW = Savings\ kW$$

$$Customer\ kWh = Savings\ kW \times Hours$$

$$PCkW = Savings\ kW \times CF$$

$$Customer\ Dth = (BTU\ Savings\ Factor \times Input\ Capacity)/1000000$$

Variables

Savings kW	See Table 1.1.2.a	Kilowatt savings per unit installed.
BTU Savings Factor	See Table 1.1.2.b	Annual BTU savings per Btuh input of cooking appliance
CF	See Table 1.2.2.a	Coincidence Factor
Hours	See Table 1.1.2.a	Annual Hours of Operation
Incremental costs	See Table 1.2.2.b	Difference in cost between the standard equipment and the more efficient equipment.
Measure Life	See Table 1.2.2.b	

Customer Inputs	**M&V Verified**	
Model Name	Yes	
Model Number	Yes	
Quantity	Yes	
Size	Yes	
Input Capacity BTUH	Yes	

Table 1.1.2.a Pre and Post Restrofit Equipment [3]

Post-retrofit technology	**Pre-retrofit technology**	**Savings kW**	**Hours (Baseline & Efficient)**
Hot Food Holding Cabinet	Cabinet	0.29	5475

Table 1.1.2.b Pre and Post Restrofit Equipment [1,4]

Post-retrofit technology	**Pre-retrofit technology**	$BTU_{Cooking\_Appliance}$ Savings Factor (Btu per Btuh_In per year)
Convection Oven	Deck Oven	1,892
Conveyor Oven	Pizza Deck oven	1,542
Combi-Oven	Steamer	1,183
Fryer	Standard Fryer	328
Pasta Cooker	Range	1,689
Upright Broiler	Broiler	1,041
Charbroiler	Standard Charbroiler	1,078
Salamander Broiler	Broiler	885
Rotisserie Oven	Rotisserie Oven	554
Rotating Rack Oven	Deck Oven	948

Table 1.2.2.a Deemed Equipment Information [3]

	Measure Life (yrs)	**Baseline Cost**	**Incremental Cost**	**Coincidence Factor (CF)**
Hot Food Holding Cabinet	12	$2,069	$1,713	85.40%

Table 1.2.2.b Deemed Equipment Information [4]

	Measure Life (years) 2	**Incremental Cost Per Name Plate Input Btuh ($/Btuh_In) [4,5]**
Convection Oven	12	$0.0375
Conveyor Oven	12	$0.0590
Combi-Oven	12	$0.0356
Rotisserie Oven	12	$0.0156
Rotating Rack Oven	12	$0.0295
Fryer	12	$0.0424
Pasta Cooker	12	$0.0310
Upright Broiler	12	$0.0377
Charbroiler	12	$0.0267
Salamander Broiler	12	$0.0165

References:

1. Savings per installed BTU derived from the Arkansas Food Service Deemed Savings table
2. Minnesota TRM 3.0
3. ENERGY STAR
4. MN DER, 2012 Deemed Savings
5. Incremental costs confirmed using "Commercial Cooking Appliance Technology Assessment, FSTC Report #5011.02.2, Food Service Technology Center, 2002" and product

Changes from Recent Filing:

1.3 Ozone Laundry

Algorithms

$$Custmer\ Therms = \left(\frac{HW_e}{WH_{eff}}\right) \times W_{utiliz} \times W_{hotusage} \times \%HotWaterSavings$$

$$Customer\ Water\ Savings = W_{usage} \times W_{utiliz} \times \%Water\ Savings$$

$$O\&M\ Savings = (Water\ Savings \times (Water\ Rate + Sewer\ Rate) \div 1000) - (o\&M\ Cost \times Lb\ Capacity)$$

Variables

% Hot_Water_Savings	0.81	How much more efficient is an ozone injection machine as a rate of hot water reduction (Reference 2)
W_{usage} (gal/lb of laundry)	2.03	How efficiently a typical conventional washing machine utilized hot and cold water per unit of clothes washed (Reference 2)
% Water_Savings	25%	How much more efficient an ozone injection washing machine is compared to a typical conventional washing machine as a rate of hot and cold water reduction (Reference 2)
$W_{usage\text{-}hot}$ (gallons/lbs laundry)	1.19	Hot water used by a typical conventional washing machine (Reference 2)
HW_e(Therms/gal)	0.007193	Energy required to make 140F hot water from 51.9 F ground water
Water Rate ($/1000 gal)	3.44	Reference 3
Sewer Rate ($/1000 gal)	5.04	Reference 3
Water Heater Thermal Efficiency (WH_{Eff})	See Table 1.1.3	
O&M Cost ($ per lb capacity of washing mac	$0.79	Reference 3
$Therm_{baseline}$ / Lb capacity of washing machin	37.9	Reference 3
Incremental costs	See Table 1.2.3	Difference in cost between the standard equipment and the more efficient equipment.
Measure Life	See Table 1.2.3	

Customer Inputs	**M&V Verified**	
Wutiliz (lbs laundry/yr)	Yes	Annual pounds of clothes washed per year.
Water Heater Type	Yes	Standard Gas Storage WH, Condensing Gas WH, Tankless Gas WH or Plant Gas Boiler with Storage Tank
Lb capacity of washing machine	Yes	Lb capacity of washing machine served by ozone generator

Table 1.1.3 Water Heater Efficiencies for Ozone Laundry

Water Heater Type	Thermal Eff (%)
Gas Non-Condensing Storage	80%
Gas Condensiing Storage	95%
Gas Tankless	96%
Gas Storage with Side-Arm Boiler	80%

Table 1.2.3 Measure Lifes and Incremental Costs [1,2]

	Lifetime Years	Incremental Cost
Ozone Washing Machine <=100lbs	10	$8,750.00
Ozone Washing Machine >100lbs<500lbs	10	$15,500.00
Ozone Washing Machine =>500lbs	10	$27,500.00

References:

1. MN custom rebates and conversations with Distributors (Tim Stoklosa, Clean Energy Designs in Lakewood CO)
2. Illinois 2017 TRM ; http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_6/Final/IL-TRM_Effective_010118_v6.0_Vol_2_C_and_I_020817_Final.pdf
3. St Paul 2015 Water Rate Schedule - http://mn-stpaul.civicplus.com/DocumentView.asp?DID=3493 (From 2017-2019 MN Energy Efficient Showerhead Tech Assumptions)

Changes from Recent Filing:

1.4 Steam Cookers

Algorithms

$$Customer\ Dth = Quantity \times (Therm\ Savings)/10$$

$$O\&M\ Savings = Quantity \times Water\ Savings \times Water\ Rate$$

Variables

Therm Savings	See Table 1.1.4	Therms saved by Energy Star Steam Cooker (Reference 2)
Water Savings	See Table 1.1.4	Gallons of water saved by Energy Star Steam Cooker (Reference 2)
Incremental costs	See Table 1.2.4	Difference in cost between the standard equipment and the more efficient equipment. (Reference 2)
Measure Life	See Table 1.2.4	(Reference 3)

Customer Inputs	**M&V Verified**	
Facility Description	Yes	
Number of Pans	Yes	
Quantity	Yes	

Table 1.1.4 Steam Cooker Savings [2]

Facility Description	Number of Pans	Therm Savings	Gallons of Water Saved
Fast Food 6am-Midnight	3	1,043	72,000
	4	1,201	96,000
	5	1,362	120,000
	6+	1,520	144,000
Fast Food 24 Hr	3	1,299	90,000
	4	1,498	120,000
	5	1,699	150,000
	6+	1,898	180,000
Casual Dining 3pm-11pm	3	348	23,500
	4	398	31,200
	5	449	39,000
	6+	499	46,800
Casual Dining 11am-11pm	3	570	39,000
	4	655	52,000
	5	724	65,000
	6+	827	78,000
Casual Dining 24 Hr	3	1,299	90,000
	4	1,498	120,000
	5	1,699	150,000
	6+	1,898	180,000
Institutional	3	537	36,500
	4	616	48,667
	5	696	60,833
	6+	776	73,000
School	3	137	9,000
	4	156	12,000
	5	175	15,000
	6+	194	18,000

Table 1.2.4 Deemed Equipment Information [4]

	Measure Life	Incremental Cost
Steam Cooker	12	$2,270.00

References:

1. Department of Energy. ENERGY STAR Commercial Steam Cooker Key Product Criteria, August 2003
2. Department of Energy. Savings Calculator for ENERGY STAR Certified Commercial Kitchen Equipment, October 2016
3. California Public Utilities Commission, Database for Energy Efficiency Resources (DEER). Spreadsheet: “DEER2014 EUL table update” February 2014
4. CleaResult Work Paper - Energy Star Steam Cooker

Changes from Recent Filing:

1.5 Advanced Power Strips - Replacement

Algorithms

$$Customer\ kWh = kWh_{Baseline} \times Savings\ Factor$$

$$Customer\ kW = \frac{Customer\ kWh}{Hours\ of\ Use}$$

$$Customer\ Coincident\ kW = Customer\ kW \times Coincidence\ Factor$$

Variables

$kWh_{Baseline}$	356	Annual average consumption of baseline power strip (References 1, 4)
Savings Factor	19%	(References 1, 5)
Hours of Use	6588	Annual Hours of Use (References 1, 5)
Coincidence Factor	83%	Peak Coincidence Factor (References 1, 6)
Lifetime	7	Measured lifetime (References 1, 3)

References:

1. State of Minnesota Technical Reference Manual for Energy Conservation Improvement Programs Version 3.1.
2. Illinois Stakeholder Advisory Group. Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 6.0, Volume 3.
3. Electronics and Energy Efficiency: A Plug Load Characterization Study SCE0284, Southern California Edison, Ohio Energy Utilities Technical Resource Manual.
4. Cadmus, Only as Smart as It's Owner: A Connected Device Study.
5. Illume, Overview of the Tier 1 Advanced PowerStrip: Potential Savings and Programmatic Uses. September 15, 2014 http://www.amconservationgroup.com/wp-content/uploads/2014/12/Illume-Advanced-Powerstrip-Case-Study.pdf
6. Efficiency Vermont, Technical Reference User Manual (TRM), pages 138-141. December 31, 2018

Changes from Recent Filing:

1. TV Timer Measure for Home Energy Squad-MN was removed and replaced with the Advanced Power Strips Tier 1 and Tier 2 at the direction of the Program Manager.

1.6 ENERGY STAR Clothes Dryer

Algorithms

$$Customer\ kWh = Load\ \times \left(\frac{1}{CEF_{Base}} - \frac{1}{CEF_{Eff}}\right) \times N_{Cycles}\ _{\times\ \%}Electric$$

$$Customer\ Coincident\ kW = \frac{Customer\ kWh}{Hours}\ /\times Coincidence\ Factor$$

$$Customer\ Dth = Load\ \times \left(\frac{1}{CEF_{Base}} - \frac{1}{CEF_{Eff}}\right) \times NCycle_{s}\ _{\times\ \%}Gas\ \times 0.003412$$

Variables

Load	Table 1.1.6	Average total weight of clothes per drying cycle (Reference 3)
CEF_{Base}	Table 1.1.6	Combined energy factor of baseline unit (Reference 4)
CEF_{Eff}	Table 1.1.6	Combined energy factor of efficient unit (Reference 3)
N_{Cycles}	250	Annual number of dryer loads (Reference 5)
%Electric	Table 1.1.6	Percent of energy savings from electricity (Reference 6)
%Gas	Table 1.1.6	Percent of energy savings from gas (Reference 6)
Coincidence Factor	0	Coincidence Factor (Reference 8)
Hours	234	Annual Hours of Use (Reference 7)
Lifetime	12	Measured Lifetime (Reference 1)

Table 1.1.6 Loads and CEF Values Across Dryer Types

Dryer Product Class	Load (lbs)	CEF_{Base}	CEF_{Eff}	%Electric	%Gas
Electric, Vented or Ventless, Standard	8.45	3.73	3.93	100%	0%
Gas, Vented, Standard	8.45	3.30	3.48	16%	84%

References:

1. State of Minnesota Technical Reference Manual for Energy Conservation Improvement Programs Version 3.1 January 20, 2020
2. Bringing North American Clothes Dryers into the 21st Century: A Case Study in Moving Markets VEIC Grasteu Associates, CLASP 2012
3. Energy Star key product criteria for clothes dryers established May 19, 2014
https://www.energystar.gov/products/appliances/clothes_dryers/key_product_criteria
4. Title 10, Code of Federal Regulations, Part 430 - Energy Conservation Program for Consumer Products, Subpart C- energy and Water Conservation standards and Their Compliance Dates https://www.ecfr.gov/cgi-bin/text-idx?rgn=div8&node=10:3.0.1.4.18.3.9.2
5. Residential Energy Consumption Survey Table HC3.7, Appliances in homes in the Northeast and Midwest Regions, 2015
https://www.eia.gov/consumption/residential/data/2015/hc/php/hc3.7.php
6. ENERGY STAR Residential Clothes Dryer Data and Analysis Draft 2 Version 1.0, August 5, 2013
7. Ecotope Inc. Dryer Field Study. Page 102 November 20, 2014 https://neea.org/img/uploads/neea-clothes-dryer-field-study.pdf
8. Navigant Consulting. EmPower Maryland Draft Final Evaluation Report Evaluation Year 4 Appliance Rebate Program March 21, 2014

Changes from Recent Filing:

1.7 ENERGY STAR Clothes Washer

Algorithms

$$Customer\ kWh = \left(\left(\frac{Cap \times N}{IMEF_{Base}}\right) \times \left(CW_{Base} + \frac{DHW_{Base} \times \%\ ElectricDHW}{R_{Eff}}\right)\right) - \left(\left(\frac{Cap \times N}{IMEF_{EE}}\right) \times \left(CW_{EE} + \frac{DHW_{EE} \times \%\ ElectricDHW}{R_{Eff}}\right)\right)$$

$$Customer\ Coincident\ kW = \frac{Customer\ kWh}{Hours} \times Coincidence\ Factor$$

$$Customer\ Dth = \left(\left(\frac{Cap \times N}{IMEF_{Base}}\right) \times \left(\frac{(DHW_{Base} \times (1 - \%ElectricDHW}{R_{Eff}}\right)\right) - \left(\left(\frac{Cap \times N}{IMEF_{EE}}\right) \times \left(\frac{(DHW_{EE} \times (1 - \%ElectricDHW}{R_{Eff}}\right)\right) \times 0.003412$$

Variables

Cap	3.45	Clothes washer drum capacity (ft^3). If unknown, assume 3.45ft^3 (References 1 and 13).
$IMEF_{Base}$	Table 1.1.7	Integrated Modified Energy Factor for Federal Minimum equipment (ft^3/kWh/cycle) (References 1, 4,and 14).
$IMEF_{EE}$	Table 1.1.7	Integrated Modified Energy Factor for EnergyStar equipment (ft^3/kWh/cycle) (Reference 1 and 10).
N	Table 1.1.7	Annual number of loads (References 1 and 15).
CW_{Base}	7%	Percentage of total energy consumption for clothes washer operation for baseline equipment (References 1, and 5).
CW_{EE}	6%	Percentage of total energy consumption for clothes washer operation for EnergyStar equipment (References 1 and 5).
DHW_{Base}	33%	Percentage of total energy consumption for water heating for baseline equipment (References 1 and 5).
DHW_{EE}	31%	Percentage of total energy consumption for water heating for EnergyStar equipment (References 1 and 5).
$\%Electric_{DHW}$	Table 1.2.7	Percent of domestic hot water savings assumed to be electric (Reference 1).
R_{Eff}	Table 1.2.7	Recovery efficiency (References 1 and 7).
Coincidence Factor	Table 1.1.7	Coincidence Factor (References 1,9, and 17).
Hours	Table 1.1.7	Annual Hours of Use (Reference1).
Lifetime	11	Measured Lifetime (Reference 1 and 2).

Table 1.1.7 Sector Breakout

Sector	Unit Type	$IMEF_{Base}$	$IMEF_{EE}$	N	Hours	Coincidence Factor
Single Family	Top and Front-Load Average	1.64	2.24	258	258	3.8%
Mutifamily	Commercial Front Load	2.00	2.20	1241	1241	4.5%

Table 1.2.7 Washer Fuel Type by Factor

Fuel Type	$\%Electric_{DHW}$	R_{Eff}
Electric	100%	98%
Gas	0%	78%

References:

1. State of Minnesota Technical Reference Manual for Energy Conservation Improvement Programs Version 3.1 January 20,
2. 2008 Database for Energy Efficient Resources, Version 2008.2.05, EUL/RUL Values, October 10, 2008.
3. Weighted average of 258 clothes washer cycles per year (based on 2015 Residential Energy Consumption Survey (RECS) national sample survey of housing appliances section, West North Central Region.
nups4/www.eld.guviLurisumpuun/residential/data/2015/hc/phpi
4. 10 CFR Parts 429 and 430 [Docket Number EERE-2008—BT—STD— 0019] RIN 1904—AB90 Energy Conservation Program: Energy Conservation Standards for Residential Clothes Washers. http://www.regulations.gov/MdocumentDetail;D=EERE-2008-BT-STD-0019-0041.
5. The percentage of total energy consumption that is used for the machine, heating the hot water or by the dryer is different depending on the efficiency of the unit. Values are based on a sales weighted average of top loading and front loading units based on data from Life-Cycle Cost and Payback Period Excel-based analytical tool, available online at:
http://wwwl.eere.energy.gov/buildings/appliance standards/residential/clothes washers sup port stakeholder negotiations.htm.
6. The percentage of total (gas and electric fuel types) water heating units that are electric calculated from 2015 Residential Energy Consumption Survey (RECS) data. https://www.2ia.gov/consumption/residential/data/2015/hc/php/hc8.7.phr Fuel used by main water heater section.
7. The percentage of total (gas and electric fuel types) dryer units that are electric calculated from 2015 Residential Energy Consumption Survey (RECS) data. https://www.eia.gov/consumption/residential/data/2015/hc/php/hc3.7.php
8. To account for the different efficiency of electric and Natural Gas hot water heaters (gas water heater): recovery efficiencies ranging from 0.74 to 0.85 (0.78 used), and electric water heater with 0.98 recovery efficiency.
9. Calculated from Itron eShapes, 8,760 hourly data by end-use for Missouri, as provided by Ameren. Reference is from Illinois Technical Reference Manual June 1, 2012. Page 303.
10.Clothes Washer Program Requirements Version 7.0.
https://www.energystar.govicertified-products/sites/products/uploads/files/ENERGY%2OSTAR%20Final%20Version%2070%20Clothes %20Washer%20Program%20Requirements.pdf?2c89-939f. Accessed 10/25/2018
11. Clothes Washer Program Requirements Version 8.0.
12.ENERGY STAR Calculator. https://www.energystar.gov/sites/default/files/asset/document/appliance calculator.xlsx
13. Based on the average clothes washer volume of all units that pass the new Federal Standard on the California Energy Commission (CEC) database of Clothes Washer products accessed on 08/28/2014. Reference is from Illinois Technical Reference Manual September 28, 2018.
14. Department of Energy. Energy Efficiiency Program for certain commercial and industrial equipment
15. Department of Energy: Energy Savings Potential and RD&D Opportunities for Commercial Building Appliances Report. 2009.
16. 2015 Residential Energy Consumption Survey (RECS) Data
17. California Public Utilities District. Res Retro HIM Evaluation Report. Weighted by quantity of each efficiency level from MESP SPECTRUM. Reference it from WIFOE Techincal Reference Manual 2018.

Changes from Recent Filing:

1.8 ENERGY STAR Dehumidifiers

Algorithms

$$Customer\ kWh = CAP\ \times\ Coversion\ Factor \times Hour\ \times \left(\frac{1}{\frac{L}{kWh_{Baseline}}} - \frac{1}{\frac{L}{kWh_{ENERGYSTAR}}}\right) \times \frac{1}{24}$$

$$Customer\ kW = \frac{Customer\ kWh}{Hours\ of\ Use}$$

$$Customer\ Coincident\ kW = Customer\ kW \times Coincidence\ Factor$$

Variables

CAP	Customer Input	Capacity (pints/day) (50 pints/day if unknown)
$L/kWh_{Baseline}$	Table 1.1.8	Amount of water in liters per kWh removed by baseline equipment
$L/kWh_{ENERGY\ STAR}$	Table 1.1.8	Amount of water in liters per kWh removed by ENERGY STAR equipment
Conversion Factor	0.473	Conversion Constant
Coincidence Factor	37%	Coincidence Factor - * Assume usage is evenly distributed day vs night, weekend vs weekday and is used between April and the end of September (4392 possible hours) (37% = 1620/4392)
Hours	1620	Annual Hours of Use (Refernce 1)
Lifetime	12	Measured Lifetime (Reference 3)

Table 1.1.8 - Energy Factor by Capacity of Dehumidifier

Product Capacity (Pints/Day)	$L/kWh_{Baseline}$	$L/kWh_{EnergyStar}$
35	1	2
> 35 to 45	2	2
> 45 to 54	2	2
> 54 to 75	2	2
>75	3	3

References:

1. State of Minnesota Technical Reference Manual for Energy Conservation Improvement Programs Version 3.1 January 20, 2020
2. Savings Calculator for ENERY STAR Qualified Appliances
3. ENERGY STAR Program Requirement s for Dehumidifiers Version 4.0
4. Electronic Code for Federal Regulations. Title 10, Part 430, Subpart C
5. Electronic Code for Federal Regulations. Title 10, Part 430, Subpart C, Volumne 81, FR 38396

Changes from Recent Filing:

Notes:

1. Assumed removal of equipment without replacement. This recycling program is achieving energy savings by preventing the old unit from entering the secondary market (Reference 3, page 20)

1.9 ENERGY STAR Refrigerators

Algorithms

$$Customer\ kWh = \left(kWh_{Baseline} - kWh_{EnergyStar}\right)$$

$$Customer\ Coincident\ kW = \frac{Customer\ kWh}{Hours} \times Coincidence\ Factor$$

Variables

$kWh_{Baseline}$	Table 1.2.9	Annual energy consumption of the baseline efficiency unit (Refence 2).
$kWh_{EnergyStar}$	Table 1.2.9	Annual energy consumption of the ENERGY STAR unit (Reference 2).
Coincidence Factor	64%	Coincidence Factor (Reference 9).
Hours	8760	Annual Hours of Use (Reference 1).
Lifetime	Table 10.1.9	Measured Lifetime (Reference 1).

Table 1.1.9 Product Lifetime

Product	Lifetime
ENERGY STAR Refrigerators	14
ENERGY STAR Freezers	11

Table 1.2.9 Annual Energy Consumption for Refrigerators and Freezers

Product	Product Class	$kWh_{EnergyStar}$	$kWh_{Baseline}$	Energy Savings (kWh/year)
ENERGY STAR Refrigerators	Top-Mounted freezer or refrigerator only (automatic	320	356	36
ENERGY STAR Refrigerators	Side by side (automatic defrost)	384	426	42
ENERGY STAR Refrigerators	Side by side with through the door ice (automatic defrost)	514	562	48
ENERGY STAR Refrigerators	Bottom-mounted freezer (automatic defrost)	406	451	45
ENERGY STAR Refrigerators	Bottom-mounted freezer with through the door ice (automatic defrost)	562	615	53
Refrigerator Average				45
ENERGY STAR Freezers	Chest	272	302	30
ENERGY STAR Freezers	Compact Chest	345	383	38
ENERGY STAR Freezers	Compact Upright (manual defrost)	411	456	45
ENERGY STAR Freezers	Compact Upright (automatic defrost)	560	623	63
ENERGY STAR Freezers	Upright (manual defrost)	308	342	34
ENERGY STAR Freezers	Upright (automatic defrost)	412	458	46
Freezer Average				43

References:

1. State of Minnesota Technical Reference Manual for Energy Conservation Improvement Programs Version 3.1 January 20, 2020
2. 2008 Database for Energy efficient Resources, EUL/RUL (Effective/Remaining Useful Life) Values
3. Incremental costs from ENERGY STAR Appliances Savings Calculator.
4. Annual Energy Based on default unit volumes, Federal energy standards and ENERGY STAR requirements as given in the ENERGY STAR Calculator
5. Savings Calculator for ENERGY STAR- Qualified Appliances; workbook tabs 'Refrigerator Calcs,' 'Compact Refrigerator Calcs,' and 'Freezer Calcs.'
6. Code for Federal Regulations: Title 10, Chapter II, Subchapter D, Part 4303, Subpart B, Appendices A1 and B1
7. Energy Conservation Program: Standards for Residential Refrigerators, Refrigerator-Freezers, and Freezers; Final Rule, Table 1
8. ENERY STAR Program Requirements for Residential Refrigerators and Freezers, Table I.1
9. Data to support CF from "Domestic Refrigerators: Field Studies and Energy Efficiency Improvement", M. Siddhartha Bhatt, CPRI, July 2001.

Changes from Recent Filing:

1.10 Dehumidifier Recycling

Algorithms

$$Customer\ kWh = Existing\ Equipment\ Quantity\ \times Product\ Capacity \times Pints\ per\ Day\ Conversion\ \times Hours\ of\ Use\ \times \frac{1}{Energy\ Factor} \times Reduction\ Factor$$

$$Customer\ kW = \frac{Customer\ kWh}{Hours\ of\ Use}$$

$$Customer\ Coincident\ kW = \ Customer\ kW \times Coincidence\ Factor$$

Variables

Product Capacity	Table 1.1.10	Deemed weighted average unit capacity (Reference 1)
Energy Factor	Table 1.1.10	Deemed weighted average energy factor (Reference 1)
Pints per Day Conversion	0.0197	Capacity conversion factor :: Liters / Hour = Pints/day * 0.473 L/Pint / 24 Hrs/day
Hours of Use	2,160	Deemed operating hours per year (Reference 1).
Coincident Factor	100%	Probability of equipment operating during peak time (Reference 5).
Reduction Factor	57%	Probability that an appliance isn't recycled (Reference 3, page 20).
Lifetime	5	Deemed remaining service lifetime of removed equipment (Reference 4).

Table 1.1.10 - Energy Factor by Capacity of Dehumidifier for Energy Star Models before 2012*

Product Capacity Range (Pints/Day)	Product Capacity (Pints/Day)	Histogram data from Energy Star QPL 2016		Energy Factor (L/kWh)
≤ 25	20.0	0	0%	1.20
> 25 to ≤ 35	30.0	22	21%	1.40
> 35 to ≤ 45	40.0	10	10%	1.50
> 45 to ≤ 50	48.0	24	23%	1.60
> 50 to < 54	52.0	0	0%	1.60
> 54 to < 75	65.0	42	41%	1.80
≥ 75	100.0	5	5%	2.50
Weighted Market Average	53.0	N/A	N/A	1.7

* Market penetration of Energy Star dehumidifiers in 2010-11 was 99%, so we are neglecting standard efficiency models (Reference 2)

References:

1. "Dehumidifiers: A Major Consumer of Residential Electricity"; ACEEE Summer Study on Energy Efficiency in Buildings, 2012; available at: https://aceee.org/files/proceedings/2012/data/papers/0193-000291.pdf
2. Energy Star Unit Shipment and Sales Data Archives, available at: https://www.energystar.gov/index.cfm?c=partners.unit_shipment_data_archives
3. Impact, Process, And Market Study Of The Connecticut Appliance Retirement Program: Overall Report; December 23, 2005; available at: https://www.energizect.com/sites/default/files/Appliance%20Retirement%2012-05.pdf
4. New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs – Residential, Multi-Family, and Commercial/Industrial Measures Version 6; April 16, 2018; available at: http://www3.dps.ny.gov/W/PSCWeb.nsf/All/72C23DECFF52920A85257F1100671BDD?OpenDocument
5. Michigan Energy Measures Database 2018; available at: https://www.michigan.gov/mpsc/0,4639,7-159-52495_55129---,00.html

Changes from Recent Filing:

Notes:

1. Assumed removal of equipment without replacement. This recycling program is achieving energy savings by preventing the old unit from entering the secondary market (Reference 3, page 20)

1.11 Refrigerator Recycling

Algorithms

$$Customer\ kWh = Existing\ Equipment\ Quantity\ \times Base\ kWh \times Refrigerator\ Factor$$

$$Customer\ kW = \frac{Customer\ kWh}{Hours\ of\ Use}$$

$$Customer\ Coincident\ kW = \ Customer\ kW \times Coincidence\ Factor$$

Variables

Refrigerator Factor	Table 1.1.11	Deemed adjustment between refrigerators and freezers (Reference 3).
Base kWh	Table 1.2.11	Deemed energy usage based on the age of the equipment (References 1,5,6,7,8,9).
Coincidence Factor	64%	Probability of equipment operating during peak time (Reference 4, Table 4).
Hours of Use	5,592	Annual hours in a year (8760) multiplied by the Coincidence Factor.
Lifetime	See Table 1.1.11	Deemed remaining service lifetime of removed equipment (References 2,9).

Table 1.1.11

Equipment	Refrigerator_Factor	Lifetime
Freezer	0.85	7
Primary Refrigerator	1.00	8
Secondary Refrigerator	1.00	8

Table 1.2.11

Year of equipment manufacture	Base_kWh
1970 and Earlier	2,344
1971	2,330
1972	2,316
1973	2,242
1974	2,205
1975	2,119
1976	1,996
1977	1,927
1978	1,879
1979	1,748
1980	1,637
1981	1,513
1982	1,505
1983	1,457
1984	1,423
1985	1,313
1986	1,324
1987	1,195
1988	1,176
1989	1,132
1990	1,129
1991	1,123
1992	1,117
1993	797
1994	792
1995	788
1996	790
1997	793
1998	795
1999	798
2000	800
2001	553
2002	550
2003	547
2004	543
2005	540
2006	537
2007	534
2008	531
2009	528
2010	525
2011	522
2012	519
2013	516
2014	429

References:

1. Baseline kWh and Average to peak kW ratio from 1995 and 2012 versions of Residential Energy Data Sourcebook for the U.S. Residential Sector. Berkeley, CA: Lawrence Berkeley National Laboratory. LBNL-40297
2. Data on expected life for savings on secondary refrigerators, 9th year Persistence Study for Southern California Edison, KEMA-XENERGY, 2004
3. Estimate for annual energy use for freezers as percent of refrigerator use. See Table Final Estimates on page 6-15 of report by KEMA-XENERGY (2004). "Final Report, Measurment and Evaluation Study of 2002 Statewide Residential Appliance Recycling Program." February 13, 2004
4. Data to support CF from "Domestic Refrigerators: Field Studies and Energy Efficiency Improvement", M. Siddhartha Bhatt, CPRI, July 2001.
5. Degradation factor cited in "2006 Refrigerator/Freezer Recycling Program Evaluation", Snohomish County PUD, Kevin L. Smit, February 2007.
6. Shipment Weighted Efficiencies from Residential Energy Databook, Years 1950 - 1995, http://enduse.lbl.gov/Projects/RED.html
7. Refrigerator-Freezer Sizes and Energy Factors (Shipment-Weighted Averages), Residential Energy Databook, Years 1972 - 2010, http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=5.7.5
8. Appliance Standards Awareness Project: Ref. Association of Home Appliance Manufacturers (AHAM)
9. Actual recent program data on age of recycled units were used to create weighted average energy consumption & remaining useful life of units recycled.

Changes from Recent Filing:

2.1 Behavioral

Algorithms

$$Customer\ kWh = \left(kWh_{Baseline} - kWh_{Proposed}\right) \times F$$

$$Customer\ Coincident\ kW = (PC\ kW_{Baseline} - PC\ kW_{Proposed}\ ) \times F$$

$$Customer\ therms = \left(therms_{Baseline} - therms_{Proposed}\right) \times F$$

Variables

F	1/3	Factor to reduce the savings by 1/3 of the apparent savings over the 3 year life
C&I Lifetime	3	

Table 2.1.1

	Lifetime (yrs)
Behavioral Commercial	3
Behavioral Process	3

2.4. Behavioral Residential

Algorithms

$$kWh\ SavedGross_{Monthly\ Treatment} = (Control\ kWh\ UsagePost_{Treatment} - Group\ Rebate\ Product\ Participation) - (Treatment\ kWh\ UsagePost_{Treatment} - Group\ Rebate\ Product\ Participation)$$

$$kWh_{Gross\ Annual} = \mathbf{\Sigma}\ kWh\ SavedGross_{Monthly\ Treatment}$$

$$Gross\ Coincident\ kW = Customer\ Daily\ kW \times Treatment\ Percent\ Savings \times Peak\ Factor \times Daily\ Usage\ at\ Peak \times Coincidence\ Factor$$

$$Dth\ Saved_{Gross\ Monthly\ Treatment} = (Control\ Dth\ UsagePost_{Treatment} - Group\ Rebate\ Product\ Participation) - (Treatment\ Dth\ UsagePost_{Treatment} - Group\ Rebate\ Product\ Participation)$$

$$Dth_{Gross\ Annual} = \mathbf{\Sigma}\ Dth\ SavedGross_{Monthly\ Treatment}$$

Variables

$Treatment_{Print}$		Group of electric and gas customers receiving periodic paper reports providing feedback on their energy use.
$Treatment_{Email}$		Group of electric and gas customers receiving internet delivered reports that provide feedback on their energy use.
$Treatment_{Online}$		Group electric and gas customers (unknown size) who choose to opt-in to a web feedback portal that provides feedback on their energy use.
$Control_{Print}$		Group of electric and gas customers who are similar in structure (demographics, life stage, house size, geography) to the participant Group, but receive no contact from Xcel or its contractors.
$Control_{Email}$		Group of electric and gas customers who are similar in structure (demographics, life stage, house size, geography) to the participant Group, but receive no contact from Xcel or its contractors.
$Control_{Online}$		Group of electric and gas customers who are similar in structure (demographics, life stage, house size, geography) to the participant Group, but receive no contact from Xcel or its contractors.
Treatment kWh $Usage_{Post\ Treatment}$		Electrical energy use of the Treatment Group after the treatment as determined through multi-variate regression analysis.
Control kWh $Usage_{Post\ Treatment}$		Electrical energy use of the Control Group after the treatment as determined through multi-variate regression analysis.
Treatment Dth $Usage_{Post\ Treatment}$		Natural gas energy use of the Treatment Group after the treatment as determined through multi-variate regression analysis.
Control Dth $Usage_{Post\ Treatment}$		Natural gas energy use of the Control Group after the treatment as determined through multi-variate regression analysis.
Group Rebate Product Participation		Energy savings generated by participation in Xcel's rebate products for both Treatment and Control groups, kWh and Dth. Rebated product participation from other products, (e.g. new furnace), are savings that will be included in the regression analysis and deducted from the EFP results if statistically significant.
Behavioral Adjustment		This adjustment is applied to reduce the first year savings to 1/3rd of the actual
kWh $Saved_{Gross\ Monthly\ Treatment}$	Provided by Vendor	Monthly electric consumption savings for all homes in the treatment group.
Peak Monthly Customer kW	Provided by Vendor	Average electric demand savings per household achieved in the hour that contained the peak demand on Xcel Energy's system. Actual value is calculated each year.
Max Customer kW	Provided by Vendor	Maximum of the peak electric demand savings per household achieved in the months of June, July August or September of each year. Actual value is calculated each year.
Dth $Saved_{Gross\ Monthly\ Treatment}$	Provided by Vendor	Monthly natural gas consumption savings for all homes in the treatment group.
Peak Factor	Provided by Vendor	The ratio of energy usage in the peak hour to average hourly energy use. Actual value is calculated each year.
Daily Usage at Peak	Provided by Vendor	Percentage of energy usage in peak hour ro daily total enregy use. Actual value is calculated each year.
Coincident Factor	See Table 2.n.4	
Hours	See Table 2.n.4	
Lifetime	1	Assumed to be 1 year as the program induces behavior change and there is no equipment purchased.
Incremental Cost	$0.00	Assumed to be $0.00 as the program induces behavior change with no incurred capitol costs.
Operation & Maintenance (O&M) Savings	$0.00	Assumed to be 0.
NTG	100%	

Table 2.2.4

Measure Description	Coincidence Factor	Hours (Annual)
Online Energy Feedback & Tools	85%	8,426
Print Feedback Report - Existing Participant - Original Print Group	96%	3,861
Email Feedback Report - Existing Participant - Original Email Group	96%	3,869
Print Feedback Report - Existing Participant - 2013 Expansion Group	96%	5,018
Print Feedback Report - Existing Participant - 2014 Refill Print Group	96%	3,991
Print Feedback Report - New Participant - 2015 Expansion - High Users	96%	4,838
Print Feedback Report - New Participant - 2015 Expansion - Medium Users	96%	4,519
Print Feedback Report - New Participant - 2015 Expansion - Medium Electri	96%	3,864
Print Feedback Report - New Participant - 2015 Expansion - Low Users	96%	4,493
Print Feedback Report - New Participant - 2015 Expansion - Low Email Onl	96%	3,047
Print Feedback Report - New Participant - 2016 Refill - DF	96%	4,092
Print Feedback Report - New Participant - 2019 - DF	96%	3,397
Print Feedback Report - New Participant - 2019 - Electric Only Users	96%	3,772
Print Feedback Report - New Participant - 2020 - DF	96%	3,811
Print Feedback Report - New Participant - 2020 - Electric Only Users	96%	3,772
Print Feedback Report - New Participant - 2021 - DF	96%	3,397
Print Feedback Report - New Participant - 2021 - Electric Only Users	96%	3,772
Print Feedback Report - New Participant - 2022 - DF	96%	3,811
Print Feedback Report - New Participant - 2022 - Electric Only Users	96%	3,772

References:

1. Energy Feedback Program Data 2011-2019

Changes from Recent Filing:

2.3 High Bill Alerts - MN

Algorithms

$Customer\ kWh = kWh\ per\ Day$ × Days per year

$Customer\ Coincident\ kW = 0$

$Customer\ Dth\ = Dth\ per\ Day$ × Days per year

Variables

kWh per Day	0.077	Average over all customers in the program from Cadmus Report
Dth per Day	0.00097	Average over all customers in the program from Cadmus Report
Days per Year	365	Number of days per year
Lifetime	1	Behavioral measures have a lifetime of 1 year
kW Saved	0	Behavioral programs assumed to not save peak demand

Assumptions

Savings values are the average for all customers in the program regardless of if they ever actually receive a report
Behavioral measures do not have any demand savings
The Cadmus analysis showed more savings after the customers stopped receiving high bill alerts. We did not collect the necessary information to explain why that happens so it has not been included in this product at the moment. We will continue to monitor this during measure implementation

References:

Cadmus report on High Bill Alert Pilot Program

Changes from Recent Filing:

Created measure

3.1 All EDA Measures

Algorithms

$$Customer\ KW\ = KW_{Baseline}\ -\ KW_{Proposed}$$

$$Customer\ kWh = kWh_{Baseline} - kWh_{Proposed}$$

$$Customer\ Coincident\ (PC)KW = Customer\ KW \times Coincidence\ Factor$$

$$Customer\ Dth = Dth_{Baseline}\ - Dth_{Proposed}$$

Variables

Baseline_kW	Calculated	Energy simulation output corresponding with the peak baseline building electrical load coincident with summer cooling design conditions.
Proposed_kW	Calculated	Energy simulation output corresponding with the peak proposed building electrical load coincident with summer cooling design conditions.
CF	Calculated	Energy simulation output corresponding with the peak proposed building electrical load coincident with summer cooling design conditions.
Baseline_kWh	Calculated	Energy simulation output corresponding with the annual baseline building electrical consumption.
Proposed_kWh	Calculated	Energy simulation output corresponding with the annual proposed building electrical consumption.
Baseline_Dth	Calculated	Energy simulation output corresponding with the annual baseline building natural gas consumption.
Proposed_Dth	Calculated	Energy simulation output corresponding with the annual proposed building natural gas consumption.

Customer Inputs	**M&V Verified**	
		Building Characteristics for the proposed building are defined by building design team, which includes mechanical engineers, electrical engineers, and architects.
		Characteristics for the baseline building are defined by the energy consultant, utilizing methodology described by ASHRAE 90.1 Standard Appendix G and supplemented by Xcel Energy where required to accommodate regulatory requirements.

References:

Changes from Recent Filing:

3.2 All EEB Measures

Description

Energy Efficient Buildings (EEB) is a holistic program including electric and gas measures. Third-party consultants work with customer design teams to identify prescriptive measures from all utility programs for new commercial buildings or retrofits of existing commercial buildings. Custom measures are used for energy savings opportunities not currently available in the prescriptive programs.

Algorithms

N/A

Variables

N/A	N/A	N/A

Customer Inputs	M&V Verified	
	Yes	Building Characteristics for the proposed building are defined by building design team, which includes engineers, contractors, and architects.

References:

Changes from Recent Filing:

4.1 Electric Rate Savings

Algorithms

$$Customer\ kWh = Contract\ Interrupt\ Load \text{ x } Hours$$

$$Customer\ Coincident\ kW = Contract\ Interrupt\ Load \times Coincidence\ Factor$$

$$Customer\ kW = Contract\ Interrupt\ Load$$

Variables

Contract Interrupt Load	Customer Input	Contracted Demand Reduction. Amount of electric load reduction pledged by the customer. Assumed average for forecasting is 200 kW (Reference 1)
Hours	2.0	Full Load Hours of Operation. The equivalent full load hours during a typical year that a customer achieves energy savings at the Contracted Demand Reduction by controlling their electric load. (Reference 2)
Coincidence Factor	100%	Coincidence Factor. Percentage of the kW savings that occur during the annual hour of system peak (Reference 1)
Lifetime	5	Measure Life (Years)
NTG	100%	

Customer Inputs	**M&V Verified**	
Contracted Demand Reduction	No	
Rate Group	No	

References:

1. Contracted Demand Reduction
2. Control Period history along with customer survey data

Changes from Recent Filing:

No Changes

4.2 Peak Partner Rewards

Algorithms

$$Customer\ kWh = kW\ Commitment \text{ x } Control\ Hours$$

$$Customer\ Coincident\ kW = kW\ Commitment \times Coincidence\ Factor$$

$$Customer\ kW = kW\ Commitment$$

Variables

kW Commitment	Customer Input	Customer's average electrical load reduction during summer months
Coincidence Factor	100%	Percentage of Customer_kW savings that will coincide with peak summer kW savings
Control Hours	6	Estimated number of control hours called per year
Lifetime	1	Average contract duration

Inputs	**Verified during M&V:**
kW Commitment	Yes
Control Hours	Yes

References:

1. Control hours based on MN NSP Interruption history for last 5-years

Changes from Recent Filing

No Changes

4.3 Savers Switch

Algorithms

$$Customer\ kWh = (Baseline_{kW} - Proposed_{kW}) \times Hours$$

$$Customer\ Coincident\ kW = Baseline\_Efficiency \times Equipment\_Tons \times Coincidence\_Factor$$

$$Customer\ kW = Baseline\_Efficiency \times Equipment\_Tons$$

Variables

Equipment_Tons	Customer Input	AC unit tons.
Baseline_Efficiency_Single	1.091	Deemed single stage AC unit efficiency in kW/ton.
Baseline_Efficiency_Multi	1.091	Deemed multi stage AC unit efficiency in kW/ton.
Hours_Single	0.25	Deemed Full Load Hours of Operation for a single-stage smart switch.
Hours_Multi	0.21	Deemed Full Load Hours of Operation for a multi-stage smart switch.
Coincidence_Factor_Single	18.02%	Deemed Single Stage Coincidence Factor. Percentage of the kW savings that occur during the annual hour of system peak. Based on analysis of metered data for actual historical Business Saver's Switch customers.
Coincidence_Factor_Multi	15.13%	Deemed Mutli-Stage Coincidence Factor. Percentage of the kW savings that occur during the annual hour of system peak. Based on analysis of metered data for actual historical Business Saver's Switch customers.
Lifetime	15	Deemed Length of time the switch will be operational.
NTG	100%	Net-to-Gross factor for Saver's Switch will be 100% as customers would not have the ability to install a switch without the program.

Customer Inputs	**M&V Verified**	
AC unit tons	Yes	
Air conditioner single-stage or multi-stage	Yes	
Stage 1 and stage 2 tons (Multi-stage units only)	Yes	

References:

1. Updated PC kW & kWh savings per unit per event for smart switches. As a result other values such as coincidence factor and hours also updated.
2. Updated algorithms to match current practices.

Changes from Recent Filing:

No Changes

4.4 Smart Thermostat

Algorithms

$$STDR\ Customer\ kWh = Qty\_Prop\_Tons \times kWh\_Savings\_STDR$$

$$STDR\ Customer\ Coincident\ kW = Equip\_ST\_Tons \times kW\_Savings\_STDR \times STDR\_CF$$

$$STDR\ Customer\ kW = Equip\_ST\_Tons \times kW\_Savings\_STDR$$

$$STEE\ Customer\ kWh = Cooling\ kW\ Annual \times (ES\_Reduction\_Cooling) \times Cooling\ Hours$$

$$STEE\ Customer\ Gas\ Dth = Baseline\ Dth \times (ES\_Reduction\_Heating)$$

$$STEE\ Electric\ Heat\ kWh = Cooling\ kW\ Annual \times (ES\_Reduction\_Cooling) \times Cooling\ Hours + Heating\ kW \times (ES\_Reduction\_Heating) \times Heating\ Hours$$

$$STEE\ Customer\ Coincident\ kW = Cooling\ kW \times (ES\_Reduction\_Cooling) \times EnergyStar\_CF$$

Variables

Equip_ST_Tons	Customer Input	Quantity of Controlled tons
kW_Savings_STDR	0.368	Peak coincident kW savings per average commercial AC unit ton with a smart thermostat (Reference 3)
kWh_Savings_STDR	1.185	kWh savings per year per average commercial AC Unit ton with a smart thermostat (Reference 3).
ES_Reduction_Heating	6%	Energy Star Connected Thermostat criteria for annual heating equipment runtime reduction (Reference 3)
ES_Reduction_Cooling	9%	Energy Star Connected Thermostat criteria for annual cooling equipment runtime reduction (Reference 3)
STDR_CF	100%	Coincidence factor of demand response events
Cooling_kW	6.426	Average kW for cooling at full load
Cooling_kW_Annual	5.653	Average kW for cooling using seasonal efficiency
Cooling Hours	654	Annual cooling hours
Heating kW	5.000	Average kW for electric heating
Heating Hours	1,662	Annual heating hours
Baseline Dth	128.0	Baseline heating load per thermostat in Dth
EnergyStar_CF	0%	coincidence factor for ES Thermostats (Reference 4)
STDR Measure Life	5	Measure life for demand response DR
ES Measure Life	10	Measure life for Energy Star thermostat (Reference 4)
Incremental Cost	$95.00	Incremental cost for ENERGY STAR smart thermostat

Customer Inputs	**M&V Verified**	
AC unit tons	Yes	
Air conditioner single-stage or multi-stage	Yes	
Stage 1 and stage 2 tons (Multi-stage units only)	Yes	

References:

1. Xcel Energy, January 2016. Typical MN Business Single Stage Smart Switch Load Relief 2011-2015.
2. Xcel Energy, January 2016. Typical MN Business Dual Stage Smart Switch Load Relief 2011-2015.
3. Xcel Energy, October 2019. Commercial Smart Thermostat Demand Response Study
4. Minnesota Technical Resource Manual ver 3.0

Changes from Recent Filing:

New Product

5.1 Energy Conservation Opportunity

$$Customer\ kW = kW\ Savings$$

$$Customer\ kWh = kW\ Savings \times Hours$$

$$Customer\ Coincident\ kW = Customer\ kW \times Coincidence\ Factor$$

Variables

kWh Savings	106,530	Based on an average kWh savings from historical participation in the measure.
kW Savings	12.275	Based on an average kW savings from historical participation in the measure.
Hours	8,679	Based on average operating hours from historical participation in the measure.
Coincidence Factor	100.0%	Coincidence of energy demand savings to grid peak demand based on participation history in ECOs
Lifetime	5	Standard assumption for compressed air study life.
Incremental Cost	$2,568	Based on average incremental from historical participation in the measure.

References:

Historical participation in the measure for kW & kWh savings, costs & hours

Changes from Recent Filing:

5.2 Supply Side Study

$$\frac{kW}{SCFM} = \left(\frac{SCFM}{HP}\right)^{-1} \times \left(\frac{kW}{HP}\right) \div Motor\ Efficiency$$

$$Customer\ kW = Leak\ SCFM \times \left(\frac{kW}{SCFM}\right)$$

$$Customer\ kWh = Hours\ \times Customer\ kW$$

$$Customer\ Coincident\ kW = Customer\ kW \times Coincidence\ Factor$$

$$Incremental\ Cost = Cost\ per\ Leak\ Fix \times \#\ of\ Leaks\ Fixed + Study\ Rebate$$

Variables

Leak SCFM	Study Input	Input from Compressed Air Supply Side Study
Motor Efficiency	94.0%	Assumed Average Air Compressor Motor Efficiency
SCFM / HP	4.25	Standard rule of thumb assumption for flow reduction on a typical 100 psig system with variable speed control.
kW / HP	0.746	Standard conversion from HP to kW.
kW / SCFM	0.187	
Hours	Study Input	Input from Compressed Air Supply Side Study
Lifetime	5	Standard assumption for compressed air study life.
Coincidence Factor	100%	Savings is from flow reduction during all operating hours of the compressed air system, so is assumed to be coincident with the grid peak.
Cost per Leak Fix	$75	Standard assumption for all leak studies
# of Leaks Fixed	Study Input	Input from Compressed Air Supply Side Study

References:

(4) Analysis of Compressed Air Study participants 2016 - 2019
(7) Various anonymous retailer and vendor quotes
(9) Massachusetts Technical Reference Manual 2013-2015 Program Years
(10) Compressed Air Challenge (Best Practices Guide): source for baseline compressor curves, % efficiency/psi reduction, SCFM per orifice

Changes from Recent Filing:

5.3 Cycling Dryers

Algorithms

$$Customer\ kWh = Quantity \times kWh\ Savings$$

$$Customer\ kW = Quantity \times kW\ Savings$$

$$Customer\ Coincident\ kW = Customer\ kW \times Coincidence\ Factor$$

$$Incremental\ Cost = Quantity \times Unit\ Incremental\ Cost$$

Variables

kWh Savings	See Table 5.1.3	kWh savings based on Cycling Dryer rated CFM
kW Savings	See Table 5.1.3	kW savings based on Cycling Dryer rated CFM
Hours	See Table 5.1.3	Based on average operating hours from historical participation in compressed air studies.
Lifetime	20	Typical assumption for new industrial equipment
Coincidence Factor	82.5%	Coincidence of energy demand savings to grid peak demand based on Custom Compressed Air project history.
Incremental Cost	See Table 5.1.3	Incremental Cost of energy efficient equipment compared to less-efficient equipment option

Customer Inputs	**M&V Verified**	
Quantity of Cycling Dryers	Yes	
CFM of Cycling Dryer	Yes	

Table 5.1.3 Energy Savings and Costs For Cycling Dryers (Reference 4 & 7)

Dryer CFM	kW Savings	kWh Savings	Hours	Incremental Cost
75 CFM to 99 CFM Cycling Dryer	0.395	2,814	7,128	$450
100 CFM to 124 CFM Cycling Dryer	0.622	4,444	7,149	$508
125 CFM to 149 CFM Cycling Dryer	0.746	5,349	7,170	$441
150 CFM to 199 CFM Cycling Dryer	0.865	6,223	7,195	$704
200 CFM to 249 CFM Cycling Dryer	0.918	6,640	7,236	$1,208
250 CFM to 299 CFM Cycling Dryer	1.282	9,338	7,282	$1,060
300 CFM to 399 CFM Cycling Dryer	1.494	10,936	7,321	$1,222
400 CFM to 499 CFM Cycling Dryer	1.931	14,307	7,409	$1,378
500 CFM to 599 CFM Cycling Dryer	2.166	16,218	7,489	$1,486
600 CFM to 699 CFM Cycling Dryer	2.476	18,735	7,566	$892
700 CFM to 799 CFM Cycling Dryer	3.173	24,243	7,641	$1,228
800 CFM to 999 CFM Cycling Dryer	3.322	25,628	7,714	$2,105
1000 CFM to 1199 CFM Cycling Dryer	4.160	32,662	7,851	$2,046
1200 CFM to 1599 CFM Cycling Dryer	5.103	40,730	7,982	$2,753
1600 CFM to 1999 CFM Cycling Dryer	5.969	48,984	8,206	$4,084
2000 CFM to 2399 CFM Cycling Dryer	6.557	55,015	8,390	$5,972
2400 CFM to 2799 CFM Cycling Dryer	8.490	72,467	8,536	$4,515

References:

(4) Analysis of Compressed Air Study participants 2016 - 2019
(7) Various anonymous retailer and vendor quotes

Changes from Recent Filing:

Savings (kW, kWh) for Mist Eliminators, Cycling Dryers and Dewpoint Controls updated

5.4 Dryer Purge Demand Controls

Algorithms

$$Customer\ kWh = Quantity \times kWh\ Savings$$

$$Customer\ kW = Quantity \times kW\ Savings$$

$$Customer\ Coincident\ kW = Customer\ kW \times Coincidence\ Factor$$

$$Incremental\ Cost = Quantity \times Unit\ Incremental\ Cost$$

Variables

kWh Savings	See Table 5.2.4	kWh savings based on Cycling Dryer rated CFM
kW Savings	See Table 5.2.4	kW savings based on Cycling Dryer rated CFM
Hours	See Table 5.2.4	Based on average operating hours from historical participation in compressed air studies.
Lifetime	20	Typical assumption for new industrial equipment
Coincidence Factor	82.5%	Coincidence of energy demand savings to grid peak demand based on Custom Compressed Air project history.
Incremental Cost	See Table 5.2.4	Incremental Cost of energy efficient equipment compared to less-efficient equipment option

Customer Inputs	**M&V Verified**	
Quantity of Dryer Purge Demand Controls	Yes	
SCFM of Dryer Purge Demand Controls	Yes	

Table 5.2.4 Energy Savings and Costs for Dryer Purge Demand Control (Reference 4 & 7)

Dryer CFM	kW Savings	kWh Savings	Hours	Incremental Cost
90 CFM to 119 CFM Dewpoint Demand Control	3.901	27,866	7,144	$3,148
120 CFM to 159 CFM Dewpoint Demand Control	4.956	35,536	7,170	$3,176
160 CFM to 199 CFM Dewpoint Demand Control	6.276	45,222	7,206	$3,210
200 CFM to 249 CFM Dewpoint Demand Control	7.415	53,689	7,241	$3,515
250 CFM to 299 CFM Dewpoint Demand Control	8.576	62,491	7,287	$3,286
300 CFM to 399 CFM Dewpoint Demand Control	9.649	70,737	7,331	$3,335
400 CFM to 499 CFM Dewpoint Demand Control	11.349	84,185	7,418	$3,375
500 CFM to 599 CFM Dewpoint Demand Control	12.811	96,175	7,507	$3,438
600 CFM to 799 CFM Dewpoint Demand Control	14.243	108,144	7,593	$3,438
800 CFM to 999 CFM Dewpoint Demand Control	18.270	141,687	7,755	$3,473
1000 CFM to 1249 CFM Dewpoint Demand Control	21.946	173,722	7,916	$3,858
1250 CFM to 1499 CFM Dewpoint Demand Control	26.010	210,652	8,099	$3,678
1500 CFM to 1999 CFM Dewpoint Demand Control	29.544	244,178	8,265	$3,725
2000 CFM to 2499 CFM Dewpoint Demand Control	36.258	309,317	8,531	$3,861

References:

(4) Analysis of Compressed Air Study participants 2016 - 2019
(7) Various anonymous retailer and vendor quotes
(14) Compressed Air Best Practices (https://www.airbestpractices.com/system-assessments/air-treatmentn2/desiccant-dryers-ten-lessons-learned)

Changes from Recent Filing:

Savings (kW, kWh) for Mist Eliminators, Cycling Dryers and Dewpoint Controls updated
Uncontrolled Heatless Desiccant Dryer Purge rate used in forecast changed from 15% to 17% to align with references on Deemed Savings
Lifetime changed from 15 to 20 years since this is for new industrial equipment not just controls

5.5 Mist Eliminators

Algorithms

$$Customer\ kWh = Quantity\ \times\ kWh\ Savings$$

$$Customer\ kW = Quantity\ \times\ kW\ Savings$$

$$Customer\ Coincident\ kW = Customer\ kW \times Coincidence\ Factor$$

$$Incremental\ Cost = Quantity \times Unit\ Incremental\ Cost$$

$$O\&M\ Savings = Quantity \times Unit\ O\&M\ Savings$$

Variables

kWh Savings	See Table 5.3.5	kWh savings based on Cycling Dryer rated CFM
kW Savings	See Table 5.3.5	kW savings based on Cycling Dryer rated CFM
Hours	See Table 5.3.5	Based on average operating hours from historical participation in compressed air studies.
Lifetime	11	Assumption based on various manufacturer's rated life, also the filter element life for mist eliminators (Ref 12 & 13)
Coincidence Factor	100.0%	Coincidence of energy demand savings to grid peak demand based on Custom Compressed Air project history.
Incremental Cost	See Table 5.3.5	Incremental Cost of energy efficient equipment compared to less-efficient equipment option
O&M Savings	See Table 5.3.5	O&M cost difference of filter replacements over the lifetime.

Customer Inputs	**M&V Verified**	
Quantity of Mist Eliminators	Yes	
CFM of Dryer Mist Eliminators	Yes	

Table 5.3.5: Energy Savings and Costs for Mist Eliminator Filters (Reference 1 & 2)

Filter CFM	kW Savings	kWh Savings	Hours	Incremental Cost	O&M Savings
125 CFM to 249 CFM Mist Eliminator Filter	0.228	1,640	7,180	$2,416	$103
250 CFM to 499 CFM Mist Eliminator Filter	0.452	3,300	7,302	$2,468	$194
500 CFM to 799 CFM Mist Eliminator Filter	0.894	6,740	7,539	$2,642	$259
800 CFM to 1099 CFM Mist Eliminator Filter	1.421	11,086	7,804	$3,400	$308
1100 CFM to 1499 CFM Mist Eliminator Filter	1.941	15,627	8,049	$3,619	$369
1500 CFM to 1899 CFM Mist Eliminator Filter	2.624	21,866	8,333	$4,384	$424
1900 CFM to 2299 CFM Mist Eliminator Filter	3.328	28,450	8,549	$6,011	$520

References:

(4) Analysis of Compressed Air Study participants 2016 - 2019
(7) Various anonymous retailer and vendor quotes
(12) ZEKS Mist Eliminator (http://www.zeks.com/PDF/ZEKS%20Mist%20Eliminator.pdf)
(13) Quincy Mist Eliminator (https://www.quincycompressor.com/products/mist-eliminators)

Changes from Recent Filing:

Savings (kW, kWh) for Mist Eliminators, Cycling Dryers and Dewpoint Controls updated
Changed mist eliminator lifetime from 15 years to 11 years based on manufacturer data
Increase in O&M Savings after putting in terms of first year costs

5.6 No Air Loss Drain

Algorithms

$$\frac{kW}{SCFM} = \left(\frac{SCFM}{HP}\right)^{-1} \times \left(\frac{kW}{HP}\right) \div Motor\ Efficiency$$

$$Customer\ kW = Quantity \times Average\ SCFM \times \left(\frac{kW}{SCFM}\right)$$

$$Customer\ kWh = Hours\ \times Customer\ kW$$

$$Customer\ Coincident\ kW = Customer\ kW \times Coincidence\ Factor$$

$$Incremental\ Cost = Quantity \times Unit\ Incremental\ Cost$$

Variables

Average SCFM	2.739	Based on assumed time open and cycle interval of timed drain being replaced
Motor Efficiency	94.0%	Assumed Average Air Compressor Motor Efficiency
SCFM / HP	4.25	Standard rule of thumb assumption for flow reduction on a typical 100 psig system with variable speed control.
kW / HP	0.746	Standard conversion from HP to kW.
kW / SCFM	0.187	
kW Savings	0.511	Estimated energy savings per No Air Loss Drain from compressed air flow reduction.
Hours	7,523	Average compressed air system operating hours from participation history in program.
kWh Savings	3,848	Based on an average annual operating hours of custom compressed air projects and estimated energy savings from flow reduction.
Coincidence Factor	100.0%	Savings is from flow reduction during all operating hours of the compressed air system, so is assumed to be coincident with the grid peak.
Lifetime	13	Reference 3
Unit Incremental Cost	$323.00	Incremental Cost of energy efficient equipment compared to less-efficient equipment option

Customer Inputs	**M&V Verified**	
Quantity of No Air Loss Drains	Yes	

References:

(3) Historic compressed air product experience
(11) Massachusetts Joint Utilities "Measure Life Study". Energy & Resource Solutions. Table 1-1. 2005. Source for NALD Lifetime

Changes from Recent Filing:

NALD measure fixed incremental cost to take into account baseline cost of a timed drain

5.7 VFD Compressor

Algorithms

$$Customer\ kW = Horsepower\ \times Service\ Factor \times\ 0.746\ \times \left[\left(\frac{Baseline\ Load}{Motor\ Efficiency}\right) - \left(\frac{Proposed\ Load}{Motor\ Efficiency}\right)\right] \times\ Quantity$$

$$Customer\ kWh = Customer\ kW \times\ Hours$$

$$Customer\ Coincident\ kW = Customer\ kW \times Coincidence\ Factor$$

$$Incremental\ Cost = Quantity \times Unit\ Incremental\ Cost$$

Variables

Coincidence Factor	82.5%	Coincidence of energy demand savings to grid peak demand based on Custom Compressed Air project history.
Motor Efficiency	See Table 5.5.7.A	Efficiency of new compressor motor as determined by customer provided Compressor HP (Reference 5)
Baseline Load	87.43%	Average percent loading for new fixed speed compressors
Horsepower	Customer Input	Nominal horsepower of new compressor
Proposed Load	61.05%	Average percent loading for new VFD compressors
Hours	See Table 5.5.7.A	Operating hours of new compressors (Reference 6)
Service Factor	1.15	Service factor of an air compressor motor (Reference 1)
Lifetime	20	Typical assumption for new industrial equipment
Unit Incremental Cost	See Table 5.5.7.B	Incremental cost of efficient measures compared less-efficient option

Customer Inputs	**M&V Verified**	
Compressor HP	Yes	
Compressor Quantity	Yes	

Table 5.4.7.A: Motor Efficiencies & Operating Hours (Reference 5 & 6)

Compressor HP	Motor Description	Motor Efficiency	Operating Hours
10	10 HP 1800 RPM	91.7%	2,131
15	15 HP 1800 RPM	93.0%	2,131
20	20 HP 1800 RPM	93.0%	2,131
25	25 HP 1800 RPM	93.6%	3,528
30	30 HP 1800 RPM	94.1%	3,528
40	40 HP 1800 RPM	94.1%	3,528

Table 5.5.7.B: Incremental Costs for Efficient Measures (Reference 7)

Measure	Incremental Cost
10 HP VFD Compressor	$2,774.00
15 HP VFD Compressor	$2,792.00
20 HP VFD Compressor	$3,842.00
25 HP VFD Compressor	$5,165.00
30 HP VFD Compressor	$7,111.00
40 HP VFD Compressor	$7,556.00

References:

(1) Service factor from Compressed Air & Gas Institute (CAGI) standards comparing Nameplate HP to actual BHP @ 100% Full rated pressure and flow
(5) National Electric Manufacturers Association. Motor efficiency standards from Pre-EPAct 2005 and after.
(6) United States Industrial Electric Motor Systems Market Opportunities Assessment, EERE, US DOE, Dec 2002 - Source for operating hours for
(7) Various anonymous retailer and vendor quotes
(10) Compressed Air Challenge (Best Practices Guide): source for baseline compressor curves, % efficiency/psi reduction, SCFM per orifice

Changes from Recent Filing:

Air Compressor Service Factor changed from 1.10 to 1.15

5.8 Demand Side Study

Variables

kWh Savings	0	Demand Side Studies have no direct energy savings claimed, typically.
kW Savings	0.00	Demand Side Studies have no direct energy savings claimed, typically.
Hours	7,523	Average compressed air system operating hours from participation histroy in program.
Lifetime	5	Standard assumption for compressed air study life.
Coincidence Factor	82.5%	Coincidence of energy demand savings to grid peak demand based on Custom Compressed Air project history.
Incremental Cost	$5,003.00	Based on average demand side study cost from historical participation

References:

(4) Analysis of Compressed Air Study participants 2016 - 2019
(7) Various anonymous retailer and vendor quotes
(9) Massachusetts Technical Reference Manual 2013-2015 Program Years
(10) Compressed Air Challenge (Best Practices Guide): source for baseline compressor curves, % efficiency/psi reduction, SCFM per orifice

Changes from Recent Filing:

Table 5.6.0 Common Compressed Air Variables for Reference

Average Motor Efficiency	94.0%	Assumed Average Air Compressor Motor Efficiency
System Pressure	100	Typical pressure of compressed air system analyzed that assumptions are based on for various measure usages.
SCFM / HP	4.25	Standard rule of thumb assumption for flow reduction on a typical 100 psig system with variable speed control.
SCFM / ACFM	0.942	Conversion from Actual to Standard Flow in MN territory
Custom CF	82.5%	Coincidence Factor from Custom Compressed Air projects
kW / HP	0.746	Standard conversion from HP to kW.

References:

(1) Service factor from Compressed Air & Gas Institute (CAGI) standards comparing Nameplate HP to actual BHP @ 100% Full rated pressure and flow
(2) National Energy Efficiency Best Practices Report (http://www.eebestpractices.com)
(3) Historic compressed air product experience
(4) Analysis of Compressed Air Study participants 2015 - 2017
(5) National Electric Manufacturers Association. Motor efficiency standards from Pre-EPAct 2005 and after.
(6) United States Industrial Electric Motor Systems Market Opportunities Assessment. US DOE, Dec 2002, Appendix B2
(7) Various anonymous retailer and vendor quotes
(8) per page iv of "Tetra Tech, Process and Impact Evaluation of the Compressed Air Efficiency Program — Colorado, January 21 2014"
(9) Massachusetts Technical Reference Manual 2013-2015 Program Years
(10) Compressed Air Challenge (Best Practices Guide): source for baseline compressor curves, % efficiency/psi reduction, SCFM per orifice
(11) Massachusetts Joint Utilities "Measure Life Study". Energy & Resource Solutions. Table 1-1. 2005. Source for NALD Lifetime
(12) ZEKS Mist Eliminator (http://www.zeks.com/PDF/ZEKS%20Mist%20Eliminator.pdf)
(13) Quincy Mist Eliminator (https://www.quincycompressor.com/products/mist-eliminators)
(14) Compressed Air Best Practices (https://www.airbestpractices.com/system-assessments/air-treatmentn2/desiccant-dryers-ten-lessons-learned)

6.1 VDI

Algorithms

$$Customer\ kWh = \left(Baseline\ Computer\ kW - \left(\frac{VDI\ Wattage}{1000} + VDI\ Server\ kW\right)\right) * Quantity\ *\ Cooling\ kWh\ Factor\ *\ Hours$$

$$Customer\ Coincident\ kW = \left(Baseline\ Computer\ kW - \left(\frac{VDI\ Wattage}{1000} + VDI\ Server\ kW\right)\right) *\ Quantity\ *\ Cooling\ kW\ Factor\ *\ Coincidence\ Factor$$

$$O\&M\ Savings = \left(Baseline\ Computer\ kW - \left(\frac{VDI\ Wattage}{1000} + VDI\ Server\ kW\right)\right) *\ Quantity\ *Hours\ *Heating\ Penalty\ Facotr\ *Gas\ Cost + (O\&M\ Labor\ Savings\ - O\&M\ License\ Cost)\ *Quantity$$

Variables

Baseline Computer kW	0.0213	Aggregated power demand of a baseline desktop computer (References 1-4, 11, 26)
VDI Server kW	0.0040	Average server power used to support a virtualized server (Reference 8)
Cooling kW Factor	1.33	Average annual demand of the cooling system that has to remove the heat gain caused by a desktop computer
Cooling kWh Factor	1.11	Average annual energy consumption of the cooling system that has to remove the heat gain caused by a desktop computer
Hours	8760	Number of hours that a desktop computer is connected to a virtualized server and available to operate
Coincidence Factor	100%	Probability that the calculated Customer kW will coincide with the period of peak generator operation
Heating Penalty Factor	-0.000683	Average annual energy consumption of the heating system that has to compensate for the negative heat gain associated with the more efficient desktop computer (Dth/kWh).
Gas Cost	$5.43	Forecasted natural gas rate for businesses ($/Dth)
O&M Labor Savings	$42.50	Annual labor savings per desktop (Reference 12)
O&M License Cost	$12.00	Annual software license fee per desktop (Reference 12)
NTG	100%	Net to Gross
Lifetime	10	Life of a VDI, "thin client", in years (Reference 9)
Incremental Cost	$117.00	Cost of high efficiency model over baseline model (Reference 6)

Customer Inputs	**M&V Verified**	
Quantity	Yes	Number of VDI, "thin client", devices installed instead of a desktop PC computer
VDI Wattage	Yes	Rated wattage of the VDI, "thin client", device installed

References:

1. Koomey, J., M. Cramer, M.A. Piette and J. Eto. 1995. "Efficiency Improvements in U.S. Office Equipment: Expected Policy Impacts and Uncertainties." Lawrence Berkeley Laboratory. LBL-37383. December. Table 3.
2. Energy Star Calculator Tool; LBNL 2007 or Energy Star Specification
3. Hours of operation for desktop computers from office desktops/laptops and office monitors from Piette, M. A., M. Cramer, J. Eto and J. Koomey. 1995. "Office Technology Energy Use and Savings Potential in New York." Prepared for the NY State Energy R&D Authority and Con-Ed by LBNL. Lawrence Berkeley Laboratory. LBL-36752. January 1995. p. 4-2
4. LBNL Estimate based on Reference 3
5. Ecova Consulting information from manufacturers
6. Vendor data
7. Baseline desktop PC cost assumed at $600; info from the internet indicates a PC with keyboard averages between $300-$1,000 or $650; assumed the keyboard is $50 of that (Ref 6)
8. Server Wattages from Custom Efficiency program participant; average wattage of 42 models (273W per Server / 68 Virtual Machines per Server). Wattages last confirmed in 2014.
9. 10-year life for thin-client and zero-client based on conversation with MN vendor Nowmicro
10. Not used
11. Ecos Consulting (now Ecova), 2009
12. Various Equipment Vendors
13. Measured Energy Savings and Performance of Power-Managed Personal Computers and Monitors, 1996, Lawrence Berkeley National Laboratory
14. PC and Monitor Night Status: Power Management Enabling and Manual Turn-off, 1998, Lawrence Berkeley National Laboratory
15. ENERGY STAR, 2012
16. Xcel Energy Custom Efficiency projects
17. 2014 Michaels Energy (independent 3rd party) NTG review.
18. Koomey, J., M. Cramer, M.A. Piette and J. Eto. 1995. "Efficiency Improvements in U.S. Office Equipment: Expected Policy Impacts and Uncertainties." Lawrence Berkeley Laboratory. LBL-37383. December. Table 3.
19. Cooling Plant Optimization (http://academic.udayton.edu/kissock/http/EEB/LecturesAndHomework/23-CoolingPlantOptimization/CoolingPlantOptimization.docx)
20. Georgia Tech Student Thesis (http://www-old.me.gatech.edu/energy/students/liuthesis.pdf)
21. Condenser Water Energy Savings (http://web.stanford.edu/group/narratives/classes/08-09/CEE215/ReferenceLibrary/Chillers/York%20Engineering%20Updates/Reduced%20condenser-water%20flow%20rate_energy-saving%20miracle%20or%20mirage.pdf)
22. Server Power Supplies Data Points_PMO.XLS supplied by Ecova on 9/1/14
23. 80 Plus Servers Calculator_Xcel14Aug2014.xlsx file provided by Ecova on 9/1/14
24. Internal adjustment by Xcel energy to distribute power supply cost in a commensurate with wattage served. Values will be reviewed over time as additional information becomes available.
25. Not used
26. Energy Star Office Equipment Calculator, accessed 12/21/15 from: http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/save-energy/purchase-energy-saving-products
27. Energy Star 5.0 Product Database, downloaded on 12/21/15 from historical archive
28. ECOVA - Sales market share analysis, Feb. 2016.
29. 2013 EPA Study for Energy Usage of Average Computer Sold

Changes from Recent Filing:

1. None

7.1 Custom

Customer may apply for rebate under the Custom Efficiency Program for electric or gas projects not listed under prescriptive rebate programs. Each Custom Efficiency project will be analyzed individually by Xcel Energy. Technical variables required for the analysis will be obtained from the customer or vendor. Analysis will be based on standard engineering methodologies.

Electrical energy savings and electrical demand savings will be calculated based on the project specific details. Each project will undergo an engineering review in accordance with standard engineering practices. The review will be in accordance with the calculation methodologies detailed in the prescriptive programs where applicable.

Variables

Lifetime	Product Life will be evaluated for each project, lifetimes for end use technologies will be in accordance with prescriptive programs where applicable
Coincidence Factor	Coincidence factor will be evaluated for each project.
O&M Savings	Operation and Maintenance Savings will be evaluated for each project.
Energy and Demand Savings	Energy and demand savings will be evaluated for each project.

8.1 Attic Insulation

Algorithms

$$Customer\ Dth = \left(\frac{1}{R_{struc}+R_{attic,base}} - \frac{1}{R_{struc}+R_{attic,eff}}\right)\left(\frac{A_{attic}*HDD*24}{Gas\ Heating\ Eff*1{,}000{,}000}\right)$$

$$Cooling\ kWh = \left(\frac{1}{R_{struc}+R_{attic,base}} - \frac{1}{R_{struc}+R_{attic,eff}}\right)\left(\frac{A_{attic}*CDD*24}{Cooling\ Eff*3412}\right)$$

$$Heating\ kWh = \left(\frac{1}{R_{struc}+R_{attic,base}} - \frac{1}{R_{struc}+R_{attic,eff}}\right)\left(\frac{A_{attic}*HDD*24}{Elec\ Heating\ Eff*3412}\right)$$

$$Gross\ Annual\ kWh\ Saved\ at\ Customer = Cooling\ kWh + Heating\ kWh$$

$$Customer\ kW\ (Gross\ kW) = \frac{Gross\ Annual\ kWh\ Saved\ at\ Customer}{Cooling\ Hours+Heating\ Hours}$$

$$Customer\ PCkW = \frac{Cooling\ kWh}{Cooling\ Hours}$$

$$Incremental\ Cost = [Attic\ Insul\ Cost\ per\ (ft^2 * \Delta R)] * A_{attic} * (R_{attic,eff} - R_{attic,base})$$

Variables

R_{struc}	4.39	R-Value of the existing attic structure with no insulation (Reference 2,4,5)
Dth to BTU Conversion	1,000,000	1 Dth = 1,000,000 BTU
kWh to BTU Conversion	3,412	1 kWh = 3412 BTU
Measure Lifetime	20	Deemed lifetime of measure in years (Reference 1)
HDD	See Table 8.1.0	Heating degree days, 65°F base (Reference 12)
CDD	See Table 8.1.0	Cooling degree days, 65°F base (Reference 12)
Heating Hours	See Table 8.1.0	Full load heating hours (from Residential HVAC program)
Cooling Hours	See Table 8.1.0	Full load cooling hours (from Residential HVAC program)
Gas Heating Eff	See Table 8.4.0	Heating efficiency determined based on customer's heating system type
Elec Heating Eff	See Table 8.4.0	Heating efficiency determined based on customer's heating system type
Cooling Eff	See Table 8.5.0	Cooling efficiency determined based on customer's cooling system type

Customer Inputs	**M&V Verified**	
Heating Type	Yes	Heating system type for the residence
Cooling Type	Yes	Cooling system type for the residence
$R_{attic,base}$	No	R-Value for baseline attic insulation
$R_{attic,eff}$	Yes	R-Value for upgraded attic insulation
A_{attic}	Yes	ft^2 of attic insulation added
Landlord Paid Utility?	No	For Home Energy Savings Program - Half of the incremental cost will be rebated if the landlord pays utilities
Attic Insul Cost per (ft^2·ΔR)	No	For Home Energy Savings Program - Cost per ft^2 per delta R of attic insulation provided by participating vendors
Incremental Cost	No	Cost of the attic insulation, provided by the customer for Insulation Rebates and Whole Home Efficiency

References:

See *Deemed Tables*

Changes from Recent Filing:

Update to calculation for R-value of attic structure with no insulation.

8.2 Wall Insulation

Algorithms

$$Customer\ Dth = \left(\frac{1}{R_{wall,base}} - \frac{1}{R_{wall,eff}}\right)\left(\frac{A_{wall} * HDD * 24}{Gas\ Heating\ Eff * 1{,}000{,}000}\right)$$

$$Cooling\ kWh = \left(\frac{1}{R_{wall,base}} - \frac{1}{R_{wall,eff}}\right)\left(\frac{A_{wall} * CDD * 24}{Cooling\ Eff * 3412}\right)$$

$$Heating\ kWh = \left(\frac{1}{R_{wall,base}} - \frac{1}{R_{wall,eff}}\right)\left(\frac{A_{wall} * HDD * 24}{Elec\ Heating\ Eff * 3412}\right)$$

$$Gross\ Annual\ kWh\ Saved\ at\ Customer = Cooling\ kWh + Heating\ kWh$$

$$Customer\ kW\ (Gross\ kW) = \frac{Gross\ Annual\ kWh\ Saved\ at\ Customer}{Cooling\ Hours + Heating\ Hours}$$

$$Customer\ PCkW = \frac{Cooling\ kWh}{Cooling\ Hours}$$

$$Incremental\ Cost = Wall\ Insul\ Cost\ per\ ft^2 * A_{wall}$$

Variables

$R_{wall,base}$	4.4	R-Value for baseline wall insulation, calculated assuming no cavity insulation (Reference 2,3,4,5)
$R_{wall,eff}$	13.1	R-Value for upgraded wall insulation, calculated assuming R-11 cavity insualtion (Reference 2,3,4,5)
Dth to BTU Conversion	1,000,000	1 Dth = 1,000,000 BTU
kWh to BTU Conversion	3,412	1 kWh = 3412 BTU
Measure Lifetime	20	Deemed lifetime of measure in years (Reference 1)
HDD	See Table 8.1.0	Heating degree days, 65°F base (Reference 12)
CDD	See Table 8.1.0	Cooling degree days, 65°F base (Reference 12)
Heating Hours	See Table 8.1.0	Full load heating hours (from Residential HVAC program)
Cooling Hours	See Table 8.1.0	Full load cooling hours (from Residential HVAC program)
Gas Heating Eff	See Table 8.4.0	Heating efficiency determined based on customer's heating system type
Elec Heating Eff	See Table 8.4.0	Heating efficiency determined based on customer's heating system type
Cooling Eff	See Table 8.5.0	Cooling efficiency determined based on customer's cooling system type

Customer Inputs	**M&V Verified**	
Heating Type	Yes	Heating system type for the residence
Cooling Type	Yes	Cooling system type for the residence
A_{wall}	Yes	ft^2 of wall insulation added
Landlord Paid Utility?	No	For Home Energy Savings Program - Half of the incremental cost will be rebated if the landlord pays utilities
Wall Insul Cost per ft^2	No	For Home Energy Savings Program - Cost per ft^2 of wall insulation provided by participating vendors
Incremental Cost	No	Cost of the wall insulation, provided by the customer for Insulation Rebates and Whole Home Efficiency

References:

See *Deemed Tables*

Changes from Recent Filing:

8.3 Air Sealing

Algorithms

$$Customer\ Dth = \frac{(CFM50_{base} - CFM50_{eff}) * ATF * HDD * 24}{N_{winter} * Gas\ Heating\ Eff * 1{,}000{,}000}$$

$$Cooling\ kWh = \frac{(CFM50_{base} - CFM50_{eff}) * ATF * CDD * 24}{N_{summer} * Cooling\ Eff * 3412}$$

$$Heating\ kWh = \frac{(CFM50_{base} - CFM50_{eff}) * ATF * HDD * 24}{N_{winter} * Elec\ Heating\ Eff * 3412}$$

$$Gross\ Annual\ kWh\ Saved\ at\ Customer = Cooling\ kWh + Heating\ kWh$$

$$Customer\ kW\ (Gross\ kW) = \frac{Gross\ Annual\ kWh\ Saved\ at\ Customer}{Cooling\ Hours + Heating\ Hours}$$

$$Customer\ PCkW = \frac{Cooling\ kWh}{Cooling\ Hours}$$

$$Incremental\ Cost = Air\ Seal\ Cost\ per\ ft^2 * A_{home}$$

Variables

Dth to BTU Conversion	1,000,000	1 Dth = 1,000,000 BTU
kWh to BTU Conversion	3,412	1 kWh = 3412 BTU
Measure Lifetime	10	Deemed lifetime of measure in years (Reference 1)
HDD	See Table 8.1.0	Heating degree days, 65°F base (Reference 12)
CDD	See Table 8.1.0	Cooling degree days, 65°F base (Reference 12)
Heating Hours	See Table 8.1.0	Full load heating hours (from Residential HVAC program)
Cooling Hours	See Table 8.1.0	Full load cooling hours (from Residential HVAC program)
ATF	See Table 8.2.0	Air transfer factor for converting airflow in ft^3/min to BTU/hr (Reference 12)
N_{winter}	See Table 8.3.0	Conversion factor for relating measured air leakage rate in ft^3/min at reference pressure of 50 Pa to a natural infiltration in ft^3/min (Reference 6,7)
N_{summer}	See Table 8.3.0	Conversion factor for relating measured air leakage rate in ft^3/min at reference pressure of 50 Pa to a natural infiltration in ft^3/min (Reference 6,7)
Gas Heating Eff	See Table 8.4.0	Heating efficiency determined based on customer's heating system type
Elec Heating Eff	See Table 8.4.0	Heating efficiency determined based on customer's heating system type
Cooling Eff	See Table 8.5.0	Heating efficiency determined based on customer's cooling system type

Customer Inputs	**M&V Verified**	
Heating Type	Yes	Heating system type for the residence
Cooling Type	Yes	Cooling system type for the residence
$CFM50_{base}$	No	Air leakage rate in ft^3/min determined by blower door test
$CFM50_{eff}$	Yes	Air leakage rate in ft^3/min determined by blower door test
A_{home}	Yes	Home's conditioned area in ft^2 above grade
House Stories	Yes	Number of stories above grade for the home
Landlord Paid Utility?	No	For Home Energy Savings Program - Half of the incremental cost will be rebated if the landlord pays utilities
Air Seal Cost per ft^2	No	For Home Energy Savings Program - Cost per ft^2 of condtioned home area above grade provided by participating vendors
Incremental Cost	No	Cost of the air sealing, provided by the customer for Insulation Rebates and Whole Home Efficiency

References:

See *Deemed Tables*

Changes from Recent Filing:

8.4 Weatherstripping

Algorithms

$$CFM50_{base} = \frac{Gap_{base} * Gap\ Length}{LAF}$$

$$CFM50_{eff} = \frac{Gap_{eff} * Gap\ Length}{LAF}$$

$$Customer\ Dth = \frac{(CFM50_{base} - CFM50_{eff}) * ATF * HDD * 24}{N_{winter} * Gas\ Heating\ Eff * 1{,}000{,}000}$$

$$Cooling\ kWh = \frac{(CFM50_{base} - CFM50_{eff}) * ATF * CDD * 24}{N_{summer} * Cooling\ Eff * 3412}$$

$$Heating\ kWh = \frac{(CFM50_{base} - CFM50_{eff}) * ATF * HDD * 24}{N_{winter} * Elec\ Heating\ Eff * 3412}$$

$$Gross\ Annual\ kWh\ Saved\ at\ Customer = Cooling\ kWh + Heating\ kWh$$

$$Customer\ kW\ (Gross\ kW) = \frac{Gross\ Annual\ kWh\ Saved\ at\ Customer}{Cooling\ Hours + Heating\ Hours}$$

$$Customer\ PCkW = \frac{Cooling\ kWh}{Cooling\ Hours}$$

Variables

Gap_{base}	0.391	Effective air leakage area in in^2 per foot of door gap for door without weatherstripping (Reference 6,7,10)
Gap_{eff}	0.128	Effective air leakage area in in^2 per foot of door gap for door with weatherstripping (Reference 6,7,10)
Dth to BTU Conversion	1,000,000	1 Dth = 1,000,000 BTU
kWh to BTU Conversion	3,412	1 kWh = 3412 BTU
Measure Lifetime	10	Deemed lifetime of measure in years (Reference 1)
HDD	See Table 8.1.0	Heating degree days, 65°F base (Reference 12)
CDD	See Table 8.1.0	Cooling degree days, 65°F base (Reference 12)
Heating Hours	See Table 8.1.0	Full load heating hours (from Residential HVAC program)
Cooling Hours	See Table 8.1.0	Full load cooling hours (from Residential HVAC program)
LAF	See Table 8.2.0	Leakage area factor for calculating CFM50 from a gap area (Reference 6)
ATF	See Table 8.2.0	Air transfer factor for converting airflow in ft^3/min to BTU/hr (Reference 12)
N_{winter}	See Table 8.3.0	Conversion factor for relating measured air leakage rate in ft^3/min at reference pressure of 50 Pa to a natural infiltration in ft^3/min (Reference 6,7)
N_{summer}	See Table 8.3.0	Conversion factor for relating measured air leakage rate in ft^3/min at reference pressure of 50 Pa to a natural infiltration in ft^3/min (Reference 6,7)
Gas Heating Eff	See Table 8.4.0	Heating efficiency determined based on customer's heating system type
Elec Heating Eff	See Table 8.4.0	Heating efficiency determined based on customer's heating system type
Cooling Eff	See Table 8.5.0	Heating efficiency determined based on customer's cooling system type
Incremental Cost	See Table 8.6.0	Incremental cost for door weatherstripping

Customer Inputs	**M&V Verified**	
Heating Type	Yes	Heating system type for the residence
Cooling Type	Yes	Cooling system type for the residence
Gap Length	Yes	Length of weatherstripping installed in ft
House Stories	Yes	Number of stories above grade for the home
Quantity of Doors Treated	Yes	Number of doors to be treated with weatherstripping

References:

See *Deemed Tables*

Changes from Recent Filing:

1. Weatherstripping added as a measure to Home Energy Savings Program

8.5 Renter Kit Window Film

Algorithms

$$Customer\ Dth = \frac{CFM50 * Correction\ Factor * HDD * ATF * 24}{N_{heat} * Gas\ Heating\ Eff * 1{,}000{,}000}$$

Variables

Incremental Cost	$0.00	Incremental cost for renter kit window film
CFM50	10	Assumed air leakage rate in ft^3/min at 50 Pa maintained pressure
Dth to BTU Conversion	1,000,000	1 Dth = 1,000,000 BTU
Correction Factor	0.7	Correction factor (Reference 12)
N_{heat}	13	Conversion factor for relating measured air leakage rate in ft^3/min at reference pressure of 50 Pa to a natural infiltration in ft^3/min (Reference 12)
Measure Lifetime	1	Deemed lifetime of measure in years, window film applied seasonally for the heating season
HDD	See Table 8.1.0	Heating degree days, 65^oF base (Reference 12)
ATF	See Table 8.2.0	Air transfer factor for converting airflow in ft^3/min to BTU/hr (Reference 12)
Gas Heating Eff	See Table 8.4.0	Heating efficiency determined based on customer's heating system type

Customer Inputs	**M&V Verified**	
N/A		

References:

See *Deemed Tables*

Changes from Recent Filing:

Deemed Tables

Table 8.1.0	Twin Cities
HDD	7651
CDD	634
Heating Hours	1932
Cooling Hours	520

Table 8.2.0	Twin Cities
LAF	0.0791
ATF	1.08

Table 8.3.0	N_{winter}	N_{summer}
Stories	Twin Cities	Twin Cities
1	11.384	15.379
2	9.016	12.964
3	7.788	11.676

Table 8.4.0	Gas Heating Eff	Elec Heating Eff
ASHP	N/A	1.92
GSHP	N/A	3.3
Electric Resistance	N/A	1
Natural Gas	0.8	N/A

Table 8.5.0	Cooling Eff
AC/ASHP	3.93
GSHP	4.13
Evap/None	0

Table 8.6.0	Weatherstripping Cost
Home Energy Squad	$12.00
Home Energy Savings Program	$32.00
Multifamily Building Efficiency	$30.00

References:

1. California Measurement Advisory Committee (CALMAC) Protocols, Appendix F (www.calmac.org/events/APX_F.pdf).
2. 2017 ASHRAE Fundamentals, Chapter 26, Table 1 - Thermal resistance values for building and insulating materials
3. 2017 ASHRAE Fundamentals, Chapter 26, Table 3 - Thermal resistance values of plane air spaces
4. 2017 ASHRAE Fundamentals, Chapter 26, Table 10 - Thermal resistance values for surface films
5. 2017 ASHRAE Fundamentals, Chapter 27, Example 3 - Thermal resistance values for 2x4 framing studs
6. 2017 ASHRAE Fundamentals, Chapter 16, Equation (41) - Defining equivalent air leakage area
7. 2017 ASHRAE Fundamentals, Chapter 16, Equation (48) - Defining airflow rate from infiltration.
8. 2017 ASHRAE Fundamentals; Chapter 16, Table 4 - Defining stack coefficient C_s
9. 2017 ASHRAE Fundamentals; Chapter 16, Table 6 - Defining basic model wind coefficient, C_w
10. Door leakage estimate taken from Colorado Energy Office website - http://www.coloradoenergy.org/procorner/stuff/window_air_leakage.htm
11. Estimates for air density in Minnesota based on altitude at airport - http://www.engineeringtoolbox.com/air-altitude-density-volume-d_195.html
12. MN TRM v3.1 - https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7bD0CDC86F-0000-C832-A29A-F7752BF4A0D9%7d&documentTitle=20201-159365-02

9.1 Holistic

Customer may apply for any prescriptive electric or gas rebate while participating as an enrollee in a holistic program. The values shown on Forecast Summary represent the average project characteristics, as defined by past program participation for a given technology. The technical details for a given technology are defined in the technology's Technical Assumptions.

Variables

Lifetime	Based on individual prescriptive product
Coincidence Factor	Based on individual prescriptive product
O&M Savings	Based on individual prescriptive product
Energy and Demand Savings	Based on individual prescriptive product

13.1 Home Lighting

Algorithms

$$Customer\ kWh = Number\ of\ Bulbs \times kW\ Savings\ per\ Bulb \times Hours$$

$$Customer\ kW = Number\ of\ Bulbs \times kW\ Savings\ per\ Bulb$$

$$kW\ Savings\ per\ Bulb = Baseline\ Wattage\ - LED\ Wattage$$

$$Peak\ Coincident\ kW = Customer\ kW \times Coincidence\ Factor$$

Variables

Number_of_Bulbs	Vendor Input	Number of bulbs sold.
Baseline_Wattage	Tables 1 - 4	Baseline wattages are determined using an adjusted ENERGY STAR lumen equivalency rating, adjusted for EISA requirements based on lumen ouptut. Linear lamps based on past participation. [1, 2, 9]
LED_Wattage	Manufacturer Provided	Wattage of the LED bulb, provided by each manufacturer.
Hours	Table 6	Annual hours of operation for the bulbs for both residential and non-residential segments. [3, 4, 8, 9]
CF	Table 6	Probability that peak demand of the bulb will coincide with peak utility system demand. [3, 4, 8, 9]
Lifetime Hours	Table 5	Lifetime Hours for LEDs.[5]
Measure Life	Tables 7	Measure life of the average bulb sold, determined by lifetime hours divided by hours of use by segment.
Incremental Cost of Bulbs	Table 8	Cost difference between baseline and efficient bulb options. [6, 7]
NTG	1	Net to gross.
Installation Rate	0.99	Future savings for bulbs purchased and put in storage and installed in later years. The net present value of the saving for all bulbs purchased is 100% if all bulbs are installed when purchased. Using 100% for business customers.
O&M savings	0	Operation and maintenance savings are assumed to be zero.

Provided by product Vendor:	**M&V Verified**
Number and type of bulbs purchased	Yes

Assumptions:

The baseline bulb cost and LED bulb cost will be tracked and updated at the end of the year in the status report to account for the rapid evolving market and cost for LED bulbs. The baseline will be reviewed and updated at least semi-annually and the LED bulb cost will be reviewed and updated monthly.

Specialty bulbs on the forecast include Specialty, R, BR, and ER Bulbs, 3-way Bulbs as well as PAR, MR, and MRX Bulbs as well as downlight retrofit kits

If the formula below for the PAR, MR and MRX Lamp baseline equivalent results in a negative or undefined value, the manufacturer recommendation is used.

Table 13.1.1: GSL Bulbs [1]

Minimum Lumens	Maximum Lumens	Incandescent Equivalent Wattage	
		Baseline (Exempt Bulbs)	Baseline (Post-EISA)
2,000	2,600	150	72
1,600	1,999	100	72
1,100	1,599	75	53
800	1,099	60	43
450	799	40	29
310	449	25	25

*GSL bulbs are medium screw-base bulbs that are not globe, bullet, candle, flood, reflector, or decorative shaped

Table 13.2.1: Specialty Bulbs [1]

Lumen Bins				Incandescent Equivalent Wattage	
Decorative Shape		Globe Shape		Baseline	Baseline
		1100	1300	150	72
		650	1099	100	72
		575	649	75	53
500	699	500	574	60	43
300	499	350	499	40	29
150	299	250	349	25	25
90	149			15	15
70	89			10	10

*Specialty bulbs are medium screw-base bulbs that are globe, bullet, candle or decorative shaped

R, BR, and ER Bulbs [1, 2]

Table 13.3.1: EISA Impacted [1, 2, 13]

Bulb Type	Lower Lumen Range	Upper Lumen Range	$Watts_{Base}$
R, ER, BR with medium screw bases w/diameter >2.25" (*see exceptions below)	420	472	40
	473	524	45
	525	714	50
	715	937	65
	938	1,259	75
	1,260	1,399	90
	1,400	1,739	100
	1,740	2,174	120
	2,175	2,624	150
	2,625	2,999	175
	3,000	4,500	200
*R, BR, and ER with medium screw bases w/diameter <=2.25"	400	449	40
	450	499	45
	500	649	50
	650	1,199	65
*ER30, BR30, BR40, or ER40	400	449	40
	450	499	45
	500	649	50
*BR30, BR40, or ER40	650	1,419	65
*R20	400	449	40
	450	719	45
*LED Fixtures	420	560	45
	561	837	60
	838	1,203	75
	1,204	1,681	100
	1,682	2,339	120
	2,340	3,075	150
*All reflector lamps below lumen ranges specified above	200	299	20
	300	399	30

PAR, MR, MRX Bulbs

The following equation is used to determine the baseline wattage for these bulbs, result should be rounded down to the nearest wattage in Table 4.

$$Wattsbase = 375.1 - 4.355(D) - \sqrt{227{,}800 - 937.9(D) - 0.9903(D^2) - 1479(BA) - 12.02(D * BA) + 14.69(BA^2) - 16{,}720 * ln(CBCP)}$$

D = Bulb Diameter
BA = Beam Angle
CBCP = Center Beam Candle Power

Table 13.4.1: PAR, MR, MRX Bulbs - Energy Star Permitted Wattages [1, 2]

Diameter	Permitted Wattages
16	20, 35, 40, 45, 50, 60, 75
20	50
30S	40, 45, 50, 60, 75
30L	50, 75
38	40, 45, 50, 55, 60, 65, 75, 85, 90, 100, 120, 150, 250

Table 13.5.1: Lifetime Hours [5]

Bulb Category	Lifetime (Hours)
A-Line	19,340
Specialty	25,880
Linear Lamps	49,547

Deemed Savings Guidelines:
One tab per measure
Font = Arial
Size = 10
Tables that are shared between measures should go onto the Deemed Tables tab and be referened in the variables section. The Deemed Tables tab will be published, so these tables do not need to be duplicated for each measure, however the tables can be duplicated (referenced and shown) on each measure for clarity.
Replace the tab name below and cell A1 with the measure number and measure name.
Measure name should match the forecast column "Measure Group"
Measure numbers TBD

Equations:
Go to Insert > Equation and use the equation editor to build your equation.
Font = Cambria Math
Size = 11
One empty line between equations
Format = Equation Tools > Design > Professional

Equations to include, as applicable:
Customer Coincident kW
Customer kWh
Customer Therms
Incremental Cost
O&M Savings
Rebate

One Tab
We willl go through all of the deemed sheets after round 1 to determine which constants or other information should go onto the master reference tab. The master reference tab will be added after round 1. This tab will not be published, so all constants from that One Tab that are used should be shown in the measure section.

Table 13.6.1: Hours, CF [3, 4, 8, 9, 12]

Bulb Category	Installation Type	Hours	CF	% Breakdown
A-Line	Residential	986	12.6%	94%
Specialty				
Linear Lamps				24%
A-Line and Specialty	Non-Residential	5,341	80.5%	6%
Specialty				
Linear Lamps				76%

Table 13.7.1: Measure Life

		Measure Life (Years)			
Type	Year	A-Line	Specialty	Specialty	Linear
Residential	Non- EISA	20	20	20	20
Non-Residential	Non- EISA	3.6	4.8	4.8	9.3

Table 13.8.1: Average Costs* [6, 7, 9,11]

Type	Rebate	Incremental Cost
A-Line	$1.43	$1.52
A-Line Business	$1.43	$1.52
Specialty	$1.55	$2.46
Specialty Business	$1.56	$2.50
Linear Lamps	$2.00	$12.00
Linear Lamps Business	$3.28	$14.82
MFBE Average	$5.08	$5.08
School kits 9W LED	$6.38	$6.38
School kits 11W LED	$9.62	$9.62
Squad 9W A-lamp	$2.65	$2.65
Squad 15W A-lamp	$2.65	$2.65
Squad 10 W Flood	$2.65	$2.65
Squad 6W Globe	$2.65	$2.65
Squad 5W Candelabra	$2.65	$2.65
Squad 3-Way LED	$2.65	$2.65
HESP 6W Canelabra	$4.90	$4.90
HESP 6W Globe	$4.90	$4.90
HESP 10W A-Line	$4.80	$4.80

References:

1. The Uniform Methods Project: Residential Lighting Evaluation Protocol, published April 2013. Page 11.
2. State of Illinois Energy Efficiency Technical Reference Manual Final Technical Version, effective January 1st, 2018. Vol 3, Pages 244-245.
3. Northeast Residential Lighting Hours-of-Use Study, Pages XVI and 37 and 66.
4. MN Lighting Efficiency (Midstream) deemed savings for business hours and CF.
5. Lifetime hours from Slipstream for bulbs sold in MN 2018 used to calculate weighted lifetime for A-Line and Specialty categories.
6. 2019 MN Home Lighting Product Results compiled by Slipstream (program administrator).
7. Market survey 2018 (homedepot.com, lowes.com, samsclub.com, target.com, walmart.com, etc)
8. 2016 CO Home Lighting and Recycling Evaluation by Cadmus, 2016. Pages 35, 72-73.
9. 2019 MN Lighting Efficiency data for linear lamps
10. State of Minnesota Technical Reference Manual for Energy Conservation, effective January 1st, 2019. Vol 2.2, Page 313.
11. Contracted price with vendors
12. 2015 U.S. Lighting Market Characterization (pg 116)
13. MN Technical Reference Manual Version 3.0 Page 27.

Changes from Recent Filing:

updated Hours and CF for Residential
Added in costs from all programs with lighting
Reverted lifetimes to pre-EISA due to the backstop being removed by the DOE

11.1 DX

Algorithms

$$Customer\,kWh = Size \times EFLH \times \left(\frac{12}{SEER_{Baseline}} - \frac{12}{SEER_{Eff}}\right) \times Qty$$

$$Customer\,kW = Size \times \left(\frac{12}{EER_{Baseline}} - \frac{12}{EER_{Eff}}\right) \times Qty$$

$$Customer\,PC\,kW = CF \times Size \times \left(\frac{12}{EER_{Baseline}} - \frac{12}{EER_{Eff}}\right) \times Qty$$

$$EER = SEER \times 0.85$$

$$Incremental\ Cost = Size \times Incremental\ Cost\ per\ Ton$$

Variables

EFLH	See Table 1.C	Equivalent Full Load Hours. The equivalent number of hours that the equipment would be running at full load over the course of the year.
$SEER_{Baseline}$ ($IEER_{Baseline}$)	See Table 1.A	Seasonal (or Integrated) Energy Efficiency Ratio in BTU/W-hr of standard equipment, based upon the minimum acceptable efficiency defined by ASHRAE 90.1-2010.
$EER_{Baseline}$	See Table 1.A	EER of standard equipment, based upon the minimum acceptable efficiency defined by the ASHRAE 90.1-2010.
CF	90%	Coincidence Factor.
Incremental Costs Per Ton	See Table 1.D	Incremental Costs Per Ton (Ref: Minnesota Technical Reference Manual Version 3.1)
Lifetime	20	Life of a new unit, in years

Customer Inputs	**M&V Verified**	
$SEER_{Eff}$ ($IEER_{Eff}$)	Yes	Seasonal (or Integrated) Energy Efficiency Ratio in Btu/W-hr of high efficiency equipment that the customer will install.
EER_{Eff}	Yes	EER of high efficiency equipment that the customer will install.
Size	Yes	The equipment capacity in tons.
Building Type (Facility Type)	Yes	
Zone	No	
Quantity Proposed Equipment (Qty)	Yes	

References:

1. ASHRAE, 2007, Applications Handbook, Ch. 36, table 4, Comparison of Service Life Estimates
2. 2017-2019 MN Cooling Program Participation Data, used for forecasts,minimum qualifying efficiencies
3. Minnesota Technical Reference Manual Version 3.1 for Equipment Baseline Efficiencies, Incremental costs, Coincidence Factor
4. Values derived from 2017-2019 Xcel Cooling Program participants.
5. Minnesota Energy Code 2015 for Equipment Baseline Efficiencies

11.2 WSHP

Algorithms

$$Customer\ kWh = Size \times EFLH \times \left(\frac{12}{SEER_{Baseline}} - \frac{12}{SEER_{Eff}}\right) \times Qty$$

$$Customer\ kW = Size \times \left(\frac{12}{EER_{Baseline}} - \frac{12}{EER_{Eff}}\right) \times Qty$$

$$Customer\ PC\ kW = CF \times Size \times \left(\frac{12}{EER_{Baseline}} - \frac{12}{EER_{Eff}}\right) \times Qty$$

$$EER = SEER \times 0.90$$

$$Incremental\ Cost = Size \times Incremental\ Cost\ per\ Ton$$

Variables

EFLH	See Table 1.C	Equivalent Full Load Hours. The equivalent number of hours that the equipment would be running at full load over the course of the year.
$SEER_{Baseline}$ ($IEER_{Baseline}$)	See Table 1.A	Seasonal (or Integrated) Energy Efficiency Ratio in BTU/W-hr of standard equipment, based upon the minimum acceptable efficiency defined by ASHRAE 90.1-2010.
$EER_{Baseline}$	See Table 1.A	EER of standard equipment, based upon the minimum acceptable efficiency defined by the ASHRAE 90.1-2010.
CF	90%	Coincidence Factor.
Incremental Costs Per Ton	See Table 1.D	Incremental Costs Per Ton (Ref: Minnesota Technical Reference Manual Version 3.1)
Lifetime	20	Life of a new unit, in years

Customer Inputs	**M&V Verified**	
$SEER_{Eff}$ ($IEER_{Eff}$)	Yes	Seasonal (or Integrated) Energy Efficiency Ratio in Btu/W-hr of high efficiency
EER_{Eff}	Yes	EER of high efficiency equipment that the customer will install.
Size	Yes	The equipment capacity in tons.
Building Type (Facility Type)	Yes	
Zone	No	
Quantity Proposed Equipment (Qty)	Yes	

References:

1. ASHRAE, 2007, Applications Handbook, Ch. 36, table 4, Comparison of Service Life Estimates
2. 2017-2019 MN Cooling Program Participation Data, used for forecasts,minimum qualifying efficiencies
3. Minnesota Technical Reference Manual Version 3.0 for incremental costs, coincidence factor
4. Values derived from 2017-2019 Xcel Cooling Program participants.
5. Minnesota Energy Code 2015 for Equipment Baseline Efficiencies

Changes from Recent Filing:

11.3 PTAC

Algorithms

$$Customer\,kWh = Size \times EFLH \times \left(\frac{12}{SEER_{Baseline}} - \frac{12}{SEER_{Eff}}\right) \times Qty$$

$$Customer\ kW\ = Size \times \left(\frac{12}{EER_{Baseline}} - \frac{12}{EER_{Eff}}\right) \times Qty$$

$$Customer\ PC\ kW\ = CF \times Size \times \left(\frac{12}{EER_{Baseline}} - \frac{12}{EER_{Eff}}\right) \times Qty$$

$$EER = SEER \times 0.85$$

$$Incremental\ Cost = Size\ \times Incremental\ Cost\ per\ Ton$$

Variables

EFLH	See Table 1.C	Equivalent Full Load Hours. The equivalent number of hours that the equipment would be running at full load over the course of the year.
$SEER_{Baseline}$ ($IEER_{Baseline}$)	See Table 1.A	Seasonal (or Integrated) Energy Efficiency Ratio in BTU/W-hr of standard equipment, based upon the minimum acceptable efficiency defined by ASHRAE 90.1-2010.
$EER_{Baseline}$	See Table 1.A	EER of standard equipment, based upon the minimum acceptable efficiency defined by the ASHRAE 90.1-2010.
CF	90%	Coincidence Factor.
Incremental Costs Per Ton	See Table 1.D	Incremental Costs Per Ton (Ref: Minnesota Technical Reference Manual Version 3.1)
Lifetime	20	Life of a new unit, in years

Customer Inputs	**M&V Verified**	
$SEER_{Eff}$ ($IEER_{Eff}$)	Yes	Seasonal (or Integrated) Energy Efficiency Ratio in Btu/W-hr of high efficiency equipment that the customer will install.
EER_{Eff}	Yes	EER of high efficiency equipment that the customer will install.
Size	Yes	The equipment capacity in tons.
Building Type (Facility Type)	Yes	
Zone	No	
Quantity Proposed Equipment (Qty)	Yes	

References:

1. ASHRAE, 2007, Applications Handbook, Ch. 36, table 4, Comparison of Service Life Estimates
2. 2017-2019 MN Cooling Program Participation Data, used for forecasts,minimum qualifying efficiencies
3. Minnesota Technical Reference Manual Version 3.0 for incremental costs, coincidence factor
4. Values derived from 2017-2019 Xcel Cooling Program participants.
5. Minnesota Energy Code 2015 for Equipment Baseline Efficiencies

11.4 Scroll-Screw Chiller

Algorithms

$$Customer\ kWh = Size \times EFLH \times \left(IPLV_{Baseline} - IPLV_{Eff}\right) \times Qty$$

$$Customer\ kW = Size \times \left(FLV_{Baseline} - FLV_{Eff}\right) \times Qty$$

$$Customer\ PCkW = CF \times Size \times \left(FLV_{Baseline} - FLV_{Eff}\right) \times Qty$$

$$Incremental\ Cost = Size\ \times Incremental\ Cost\ per\ Ton$$

Variables

EFLH	See Table 1.C	Equivalent Full Load Hours. The equivalent number of hours that the equipment would be running at full load over the course of the year.
$FLV_{Baseline}$	See Table 1.B	Full load cooling efficiency in kW/ton of standard equipment, based upon the minimum acceptable efficiency defined by ASHRAE 90.1-2010 for a given chiller type and size. NOTE: For non-centrifugal chillers, FLV_Baseline is the value in ASHRAE 90.1-2010. For centrifugal chillers, condenser water temperature, chilled water temperature, and condenser flow rate are used in the formula given in algorithms in order to convert the efficiency values at standard ARI conditions to the customer's actual operating conditions.
$IPLV_{Baseline}$	See Table 1.B	Integrated Part Load Value in kW/ton (representing the average efficiency over a range of loaded states) based upon the minimum acceptable efficiency defined by ASHRAE 90.1-2010 for a given chiller type and size. NOTE: For non-centrifugal chillers, IPLV_Baseline is the value in ASHRAE 90.1-2010. For centrifugal chillers, condenser water temperature, chilled water temperature, and condenser flow rate are used in the formula given in algorithms in order to convert the efficiency values at standard ARI conditions to the customer's actual operating conditions.
CF	90%	Coincidence Factor.
Incremental Costs Per Ton	See Table 1.D	Incremental Costs Per Ton (Ref: Minnesota Technical Reference Manual Version 3.1)
Lifetime	20	Life of a new unit, in years

Customer Inputs	**M&V Verified**	
FLV_{Eff}	Yes	Full Load Value cooling efficiency in kW/ton, representing the efficiency at design conditions for the customer's operating conditions.
$IPLV_{Eff}$	Yes	efficiency in kW/ton of high efficiency equipment at the customer's operating conditions.
Size	Yes	The equipment capacity in tons.
Building Type (Facility Type)	Yes	
Zone	No	
Quantity Proposed Equipment (Qty)	Yes	

References:

1. ASHRAE, 2007, Applications Handbook, Ch. 36, table 4, Comparison of Service Life Estimates
2. 2017-2019 MN Cooling Program Participation Data, used for forecasts,minimum qualifying efficiencies
3. Minnesota Technical Reference Manual Version 3.0 for incremental costs, coincidence factor
4. Values derived from 2017-2019 Xcel Cooling Program participants.
5. Minnesota Energy Code 2015 for Equipment Baseline Efficiencies

11.5 Centrifugal Chillers

Algorithms

$$Customer\ kWh = Size \times EFLH \times \left(IPLV_{AHRI\_Adj} - IPLV_{Eff}\right) \times Qty$$

$$Customer\ kW = Size \times \left(FLV_{AHRI\_Adj} - FLV_{Eff}\right) \times Qty$$

$$Customer\ PCkW = CF \times Size \times \left(FLV_{AHRI\_Adj} - FLV_{Eff}\right) \times Qty$$

$$IPLV_{AHRI\_Adj} = IPLV_{AHRI} \div K_{adj}$$

$$FLV_{AHRI\_Adj} = FLV_{AHRI} \div K_{adj}$$

$$K_{adj} = A \times B$$

$$A = 0.00000014592 \times (Lift)^4 - 0.0000346496 \times (Lift)^3 + 0.00314196 \times (Lift)^2 - 0.147199 \times (Lift) + 3.9302$$

$$B = 0.0015 \times LvgEvap + 0.934$$

$$Lift = LvgCond - LvgEvap$$

$$Incremental\ Cost = Size \times Incremental\ Cost\ per\ Ton$$

Variables

EFLH	See Table 1.C	Equivalent Full Load Hours. The equivalent number of hours that the equipment would be running at full load over the course of the year.
FLV_{AHRI}	See Table 1.B	Minimum acceptable FLV for centrifugal chillers at the AHRI Standard 550/590 rated condition of 85 °F condensing water temperature, 44 °F chilled water temperature, and 3 gpm/ton.
$IPLV_{AHRI}$	See Table 1.B	Minimum acceptable FLV for centrifugal chillers at the AHRI Standard 550/590 rated condition of 85 °F condensing water temperature, 44 °F chilled water temperature, and 3 gpm/ton.
CF	90%	Coincidence Factor.
Incremental Costs Per Ton	See Table 1.D	Incremental Costs Per Ton (Ref: Minnesota Technical Reference Manual Version 3.1)
Lifetime	20	Life of a new unit, in years

Customer Inputs	**M&V Verified**	
FLV_{Eff}	Yes	Full Load Value cooling efficiency in kW/ton, representing the efficiency at AHRI Standard 550/590 rated condition of 85 °F condensing water temperature, 44 °F chilled water temperature, and 3 gpm/ton conditions.
$IPLV_{Eff}$	Yes	Integrated Part Load Value (representing the weighted average efficiency over a range of loaded states per AHRI standard 550/590) cooling efficiency in kW/ton of high efficiency equipment at the customer's operating conditions.
LvgEvap	Yes	The full load water temperature leaving the evaporator, in °F.
LvgCond	Yes	The full load water temperature leaving the condenser, in °F.
Size	Yes	The equipment capacity in tons.
Building Type (Facility Type)	Yes	
Zone	No	
Quantity Proposed Equipment (Qty)	Yes	

References:

1. ASHRAE, 2007, Applications Handbook, Ch. 36, table 4, Comparison of Service Life Estimates
2. 2017-2019 MN Cooling Program Participation Data, used for forecasts,minimum qualifying efficiencies
3. Minnesota Technical Reference Manual Version 3.0 for incremental costs, coincidence factor
4. Values derived from 2017-2019 Xcel Cooling Program participants.
5. Minnesota Energy Code 2015 for Equipment Baseline Efficiencies

11.6 Air-Cooled Chillers

Algorithms

$$\text{Customer } kWh = Size \times EFLH \times \left(\frac{12}{SEER_{Baseline}} - \frac{12}{SEER_{Eff}}\right) \times Qty$$

$$\text{Customer kW } = Size \times \left(\frac{12}{EER_{Baseline}} - \frac{12}{EER_{Eff}}\right) \times Qty$$

$$\text{Customer PC kW } = CF \times Size \times \left(\frac{12}{EER_{Baseline}} - \frac{12}{EER_{Eff}}\right) \times Qty$$

$$EER = SEER \times 0.85$$

$$Incremental\ Cost = Size\ \times Incremental\ Cost\ per\ Ton$$

Variables

EFLH	See Table 1.C	Equivalent Full Load Hours. The equivalent number of hours that the equipment would be running at full load over the course of the year.
$SEER_{Baseline}$ ($IEER_{Baseline}$)	See Table 1.B	Seasonal (or Integrated) Energy Efficiency Ratio in BTU/W-hr of standard equipment determined per AHRI 550/590 procedures, based upon the minimum acceptable efficiency defined by local building/energy code.
$EER_{Baseline}$	See Table 1.B	EER of equipment determined by AHRI 550/590 at standard test conditions, based upon the minimum acceptable efficiency defined by local building/energy code.
Incremental Costs Per Ton	See Table 1.D	Incremental Costs Per Ton (Ref: Minnesota Technical Reference Manual Version 3.1)
CF	90%	Coincidence Factor.
Lifetime	20	Life of a new unit, in years

Customer Inputs	**M&V Verified**	
$SEER_{Eff}$ ($IEER_{Eff}$)	Yes	Seasonal (or Integrated) Energy Efficiency Ratio in Btu/W-hr of high efficiency equipment that the customer will install.
EER_{Eff}	Yes	EER of high efficiency equipment that the customer will install.
Size	Yes	The equipment capacity in tons.
Building Type (Facility Type)	Yes	
Zone	No	
Quantity Proposed Equipment (Qty)	Yes	

References:

1. ASHRAE, 2007, Applications Handbook, Ch. 36, table 4, Comparison of Service Life Estimates
2. 2017-2019 MN Cooling Program Participation Data, used for forecasts,minimum qualifying efficiencies
3. Minnesota Technical Reference Manual Version 3.0 for incremental costs, coincidence factor
4. Values derived from 2017-2019 Xcel Cooling Program participants.
5. Minnesota Energy Code 2015 for Equipment Baseline Efficiencies
6. AHRI Standard 550/590 Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle

11.7 Chiller VFD Retrofit

Algorithms

Customer $kWh = Size \times EFLH \times \left(IPLV_{VFDBaseline} - IPLV_{VFDEff}\right) \times Qty$

Customer kW $= Size \times \left(FLV_{VFDBaseline} - FLV_{VFDEff}\right) \times Qty$

$Customer\ PCkW = CF \times Size \times \left(FLV_{VFDBaseline} - FLV_{VFDEff}\right) \times Qty$

$Incremental\ Cost = Size \times Incremental\ Cost\ per\ Ton$

Variables

EFLH	See Table 1.C	Equivalent Full Load Hours. The equivalent number of hours that the equipment would be running at full load over the course of the year.
CF	-6.29%	
Incremental Costs Per Ton	See Table 1.D	Incremental Costs Per Ton (Ref: Minnesota Technical Reference Manual Version 3.1)
Lifetime	15	Life Time in years, equal to the value used in the Motors and Drives program for

Customer Inputs	**M&V Verified**	
Chiller Full Load efficiency ($FLV_{VFDBaseline}$)	Yes	Full Load Value cooling efficiency in kW/ton, representing the efficiency of existing chiller without a VFD at 100% load.
Chiller w/ VFD FLV (FLV_{VFDEff})	Yes	Full Load Value cooling efficiency in kW/ton, representing the efficiency of existing chiller with a VFD at 100% load.
Chiller Part Load efficiency ($IPLV_{VFDBaseline}$)	Yes	Integrated Part Load Value (representing the average efficiency over a range of loaded states) cooling efficiency in kW/ton of existing chiller without a VFD.
Chiller w/ VFD IPLV ($IPLV_{VFDEff}$)	Yes	Integrated Part Load Value (representing the average efficiency over a range of loaded states) cooling efficiency in kW/ton of existing chiller with a VFD.
Size	Yes	The equipment capacity in tons.
Building Type (Facility Type)	Yes	
Zone	No	
Quantity Proposed Equipment (Qty)	Yes	

References:

1. ASHRAE, 2007, Applications Handbook, Ch. 36, table 4, Comparison of Service Life Estimates
2. 2017-2019 MN Cooling Program Participation Data, used for forecasts,minimum qualifying efficiencies
3. Minnesota Technical Reference Manual Version 3.0 for incremental costs, coincidence factor
4. Values derived from 2017-2019 Xcel Cooling Program participants.
5. Minnesota Energy Code 2015 for Equipment Baseline Efficiencies

11.8 MN ERV

Algorithms

$$Cooling\ Electrical\ Energy\ Savings\ (Customer\ kWh) = ERV\ Base\ Cool\ Load\ \times \left(\frac{EER\_Baseline}{Equipment\ EER}\right) \times \left(\frac{EFLH\ Cooling}{EFLH\ Cooling\ Baseline}\right) \times \left(\frac{OA\ CFM}{OA\ CFM\ Baseline}\right) \times \frac{ERV\ Total\ Cooling\ Effectiveness}{ERV\ Total\ Cooling\ Eff\ Baseline} \times Equipment\ Qty$$

$$(Customer\ kW\ Savings) = \left(Enthalpy\ ATF\ \times OA\ CFM\ through\ ERV\ \times \frac{(Des\ OA\ Enthalpy - RA\ Enthalpy)}{12{,}000} \times ERV\ Total\ Effectiveness\ Cooling \times \left(\frac{12}{Equipment\ EER}\right) \times Equipment\ Qty\right) - Fan\ Penalty$$

$$Fan\ Penalty = \left(\frac{0.746}{Base\ Motor\ Efficiency} \times \frac{(OA\ CFM\ \times ERV\ Pressure\ Drop)}{(6356\ \times Base\ Motor\ Efficiency\ )} \times Air\ Path\ Quantity\right) \times Equipment\ Qty$$

$$Customer\ Dth = ERV\ Base\ Heat\ Load\ \times \left(\frac{OA\ CFM}{OA\ CFM\ Baseline}\right) \times \left(\frac{ERV\ Heating\ Effectiveness}{ERV\ Heating\ Eff\ Baseline}\right) \times Equipment\ Qty$$

$$Customer\ PC\ kW = Customer\ KW\ Savings\ \times\ Coincidence\ Factor$$

Variables

Base Motor Efficiency	75	(%)
Air Path Quantity	2	The number of air paths that have a pressure drop penalty (Return & Supply)
EFLH Cooling	Table 1.B	(Hours)
ERV Base Cool Load	5619 kWh	comes from internal bin analysis verified by 3rd party reviewer and includes the fan penalty
EER_Baseline	19.21	(EER)
OA CFM Baseline	11,193	(CFM) OA CFM through ERV
ERV Total Cooling Eff Baseline	73.49	(%)
EFLH Cooling Baseline	1,298	(Hours)
ERV Heating Eff Baseline	72.01	(%)
RA Enthalpy	Table 9.A	
Des OA Enthalpy	Table 9.A	
Enthalpy ATF	Table 9.A	
ERV Base Heat Load	19,893	(therms) Modeled heating savings per unit equipment
Coincidence Factor	90%	Peak Coincidence Factor
Measure Life	15	Life of a new unit, in years

Customer Inputs	**M&V Verified**	
ERV Total Cooling Effectiveness	Yes	(%)
ERV Effectiveness Sensible Heating	Yes	(%)
OA CFM	Yes	(CFM) OA CFM through ERV
ERV Pressure Drop	No	(in wg) Pressure drop for each air stream
Equipment EER	Yes	(EER)
Cooling Part Load Efficiency	No	(KW/Ton)
Market Segment	Yes	
Heating Efficiency	Yes	(%)
Equipment Qty	Yes	

Table 9.A

	Zone 1	Zone 2	Zone 3
RA Enthalpy	28	28	28
Des OSA Enthalpy	38.556	38.556	38.556
Enthalpy ATF	4.5	4.5	4.5

Incremental Capital Costs

Cost per CFM installed	$4.80	Total Cost for heating and cooling components
Cooling Cost per CFM	$0.29	Assumed 6% of incremental capital cost dedicated to cooling
Heating Cost per CFM	$4.51	Assumed 94% of incremental capital cost dedicated to heating

References:

1. NYSERDA (New York State Energy Research and Development Authority); NY Energy $mart Programs Deemed Savings Database - Source for coincidence factor
2. ASHRAE, 2007, Applications Handbook, Ch. 36, table 4, Comparison of Service Life Estimates
3. 2013-2015 MN Cooling Program Participation Data, used for developing incremental costs and forecasts
4. Minnesota Technical Reference Manual, v1.3
5. California DEER Ex Ante Measure Cost Study (http://www.deeresources.com/files/DEER2016/download/2010-2012_WO017_Ex_Ante_Measure_Cost_Study_-
6. Provided by a mechanical contracting firm in 2010 and inflation-adjusted to 2017 dollars using average inflation rate
7. NEEP Incremental Cost Study, Phases 2 and 3,Navigant. May 2014. Incremental Cost Study Phase Three Final Report. Prepared for NEEP
8. Incremental costs for MSHPs were determined from the NEEP Incremental Cost Study Phase 2 Report
9. MSHP equipment life is from Measure Life Report Residential and Commercial/Industrial Lighting and HVAC Measures; http://library.cee1.org/content/measure-life-report-
10. Values derived from 2014-2015 Xcel Cooling Program participants.

11.9 Mini-Split Heat Pump

Algorithms

$$Cooling\ Electrical\ Energy\ Savings\ (kWh) = Size \times EFLH \times \left(\frac{12}{SEER_{Baseline}} - \frac{12}{SEER_{Eff}}\right)$$

$$Heating\ Electrical\ Energy\ Savings\ (kWh) = \frac{MSHP_{Size_{Heating}}}{1000} \times MSHP\_EFLHH \times \left(\frac{1}{HSPF_{Standard}} - \frac{1}{HSPF\_Eff}\right)$$

$$Customer\ kWh = Cooling\ Electrical\ Energy\ Savings + Heating\ Electrical\ Energy\ Savings$$

$$Customer\ kW = Size \times \left(\frac{12}{EER_{Baseline}} - \frac{12}{EER_{Eff}}\right)$$

$$Customer\ PC\ kW = CF \times Size \times \left(\frac{12}{EER_{Baseline}} - \frac{12}{EER_{Eff}}\right)$$

$$Incremental\ Cost = Size \times Incremental\ Cost\ per\ Ton$$

Variables

EFLH	See Table 1.C	Equivalent Full Load Hours. The equivalent number of hours that the equipment would be running at full load over the course of the year.
MSHP_EFLHH	849	Mini-Split Heat Pump Equivalent Full Load Hours Heating: The equivalent number of hours that MSHP equipment would be running at full load over the course of the year for heating. From Heating Efficiency Program.
$SEER_{Baseline}$	See Table 1.A	Seasonal (or Integrated) Energy Efficiency Ratio in BTU/W-hr of standard equipment, based upon the minimum acceptable efficiency defined by the current building code.
$EER_{Baseline}$	See Table 1.A	EER of standard equipment, based upon the minimum acceptable efficiency defined by the current building code. If unavailable, EER_Baseline is calculated from SEER_Eff using a polynomial conversion.
HSPF_Standard	8.20	Heating Seasonal Performance Factor (HSPF) of standard equipment, based upon the minimum Federal standard for efficiency as manufactured.
CF	90%	Coincidence Factor
Incremental Costs Per Ton	See Table 1.D	Incremental Costs Per Ton (Ref: Minnesota Technical Reference Manual Version 3.1)
Measure Life[2]	18	Life of a new unit, in years

Customer Inputs	**M&V Verified**	
Cooling capacity (BTU/h)	Yes	(Btu/h) Size - Cooling capacity of equipment at standard ARI test conditions
Cooling efficiency (SEER)	Yes	SEER_Eff - Seasonal (or Integrated) Energy Efficiency Ratio in Btu/W-hr of high efficiency equipment that the customer will install.
Cooling efficiency (EER)	No	EER_Eff - Full-load efficiency of efficient equipment. If unavailable, value is calculated from SEER_Eff using a polynomial conversion.
Heating capacity (BTU/h)	Yes	(Btu/h) MSHP_Size_Heating - Heating capacity of Mini Split Heat Pump at 17 F outdoor air temperature, in BTU/h
Heating efficiency (HSPF)	Yes	HSPF_Eff - Heating Seasonal Performance Factor (HSPF) of High Efficiency equipment that the customer will install.
Climate zone	No	
Building type	Yes	
Equipment quantity	Yes	
Primary use, cooling or heating (MSHP)	No	

References:

1. Incremental costs for MSHPs were determined from the NEEP Incremental Cost Study Phase 2 Report

2. MSHP equipment life is from Measure Life Report Residential and Commercial/Industrial Lighting and HVAC Measures; http://library.cee1.org/content/measure-life-report-residential-and-commercialindustrial-lighting-and-hvac-measures

3. Minnesota Technical Reference Manual Version 3.0 for incremental costs, coincidence factor

4. Minnesota Energy Code 2015 for Equipment Baseline Efficiencies

- No heating demand (kW) saving are claimed for MSHP during winter, only summer cooling demand (kW) savings are claimed.

It is assumed that NO supplemental heating source is used.
For new Mini-Split Heat Pumps (MSHP) it is assumed that the MSHP is being installed in either new construction or to supplement an existing heating and cooling system. The MSHP rebate is intended to incent customers to install a high efficiency MSHP rather than the code level baseline unit.

11.10 Minisplit AC

Algorithms

$$Customer\ kWh\ = Size \times EFLH \times \left(\frac{12}{SEER_{Baseline}} - \frac{12}{SEER_{Eff}}\right)$$

$$Customer\ kW = Size \times \left(\frac{12}{EER_{Baseline}} - \frac{12}{EER_{Eff}}\right)$$

$$Customer\ PC\ kW = CF \times Size \times \left(\frac{12}{EER_{Baseline}} - \frac{12}{EER_{Eff}}\right)$$

$$Incremental\ Cost = Size\ \times Incremental\ Cost\ per\ Ton$$

Variables

EFLH	See Table 1.C	Equivalent Full Load Hours. The equivalent number of hours that the equipment would be running at full load over the course of the year.
$SEER_{Baseline}$	See Table 1.A	Seasonal (or Integrated) Energy Efficiency Ratio in BTU/W-hr of standard equipment, based upon the minimum acceptable efficiency defined by the current building code.
$EER_{Baseline}$	See Table 1.A	EER of standard equipment, based upon the minimum acceptable efficiency defined by the current building code. If unavailable, EER_Baseline is calculated from SEER_Eff using a polynomial conversion.
CF	90%	Coincidence Factor
Incremental Costs Per Ton	See Table 1.D	Incremental Costs Per Ton
Measure Life[2]	18	Life of a new unit, in years

Customer Inputs	**M&V Verified**	
Cooling capacity (BTU/h)	Yes	(Btu/h) Size - Cooling capacity of equipment at standard ARI test conditions
Cooling efficiency (SEER)	Yes	SEER_Eff - Seasonal (or Integrated) Energy Efficiency Ratio in Btu/W-hr of high efficiency equipment that the customer will install.
Cooling efficiency (EER)	No	EER_Eff - Full-load efficiency of efficient equipment. If unavailable, value is calculated from SEER_Eff using a polynomial conversion.
Climate zone	No	
Building type	Yes	
Equipment quantity	Yes	
Primary use, cooling or heating (MSHP)	No	

References:

1. Incremental costs were determined from the NEEP Incremental Cost Study Phase 2 Report
2. Equipment life is from Measure Life Report Residential and Commercial/Industrial Lighting and HVAC Measures; http://library.cee1.org/content/measure-
3. IECC 2018 for Equipment Baseline Efficiencies
4. For new Mini-Split Air Conditioners (MSAC) it is assumed that the MSAC is being installed in either new construction or to supplement an existing

11.11 CRAC Units

Algorithms

$$Customer\ kWh_{No\ Economizer} = Size * EFLH * \left(\frac{12}{3.412 * SCOP_{Baseline}} - \frac{12}{3.412 * SCOP_{Eff}}\right) * Quantity$$

$$Customer\ Coincident\ kW_{No\ Economizer} = CF * Size * \left(\frac{12}{3.412 * SCOP_{Baseline}} - \frac{12}{3.412 * SCOP_{Eff}}\right) * Quantity$$

$$Customer\ kWh_{With\ Economizer} = \left(\begin{array}{l} Size * Hours_{Not\ Economizing} * \left(\frac{12}{3.412 * SCOP_{Baseline}} - \frac{12}{3.412 * SCOP_{Eff}}\right) + \\ Economizer\ Size * Hours_{Economizing} * \left(\frac{12}{3.412 * SCOP_{Adj\ Baseline}} - \frac{12}{3.412 * SCOP_{Economizer\ Eff}}\right) \end{array}\right) * Quantity$$

$$Customer\ Coincident\ kW_{With\ Economizer} = CF * Size * \left(\frac{12}{3.412 * SCOP_{Baseline}} - \frac{12}{3.412 * SCOP_{Eff}}\right) * Quantity$$

Variables

EFLH	8760	Equivalent Full Load Hours. The equivalent number of hours that the equipment would be running at full load over the course of the year.
$Hours_{Not\ Economizing}$	See Table #.1.0	Number of hours that cooling is provided by compressors
$Hours_{Economizing}$	See Table #.1.0	Number of hours that cooling is provided by economization
$SCOP_{Baseline}$	See Table #.2.0	The minimum acceptable SCOP, as defined by the DOE, for a specific size and type of equipment (Reference 2)
$SCOP_{Adj\ Baseline}$	See Table #.2.0	The minimum acceptable SCOP during economizer operation, which is defined by adjusting the DOE minimum acceptable SCOP to align with Test D of the rating standard (Reference 1).
Coincidence Factor	100%	Probability that the calculated Customer kW will coincide with the period of peak generator operation
Lifetime	20	Life of a new CRAC unit, in years
Incremental Cost	See Table #.2.0	Incremental cost incurred for purchasing a CRAC unit that is more efficient than the DOE minimum requirement (Reference 3)

Customer Inputs	**M&V Verified**	
Size	Yes	The rated equipment sensible capacity in tons, based on the actual indoor operating conditions of the data center (RAT and RH) and the outdoor conditions specified in the rating standard (Reference 1). The maximum eligible unit size is 759,999 Btu/h (63.3 tons).
$SCOP_{Eff}$	Yes	The rated SCOP of the equipment that the customer will install, based on the actual indoor operating conditions of the data center (RAT and RH) and the outdoor conditions specified in the rating standard (Reference 1).
Economizer Size	Yes	The rated equipment sensible capacity during economization in tons, based on the actual indoor operating conditions of the data center (RAT and RH) and the outdoor conditions specified in Optional Test D of the rating standard (Reference 1). The maximum eligible unit size is 759,999 Btu/h (63.3 tons).
$SCOP_{Economizer\ Eff}$	Yes	The SCOP of the equipment that the customer will install, based on the actual indoor operating conditions of the data center (RAT and RH) and the outdoor conditions specified in Test D of the rating standard (Reference 1).
Quantity	Yes	Number of more efficient CRAC units that the customer installed

Table #.1.0

Equipment Type	**$Hours_{Economizing}$**	**$Hours_{Not\ Economizing}$**
CRAC, Air-Cooled with Economizer	3,047	5,713
CRAC, Water-Cooled with Economizer	2,180	6,580
CRAC, Glycol-Cooled with Economizer	2,321	6,439

Table #.2.0

Equipment Type	Net Sensible Cooling Capacity (Btu/h)		SCOP_Standard		SCOP_Standard_Adj		Incremental Cost
	Lower Limit ≥	Upper Limit <	Downflow Units	Upflow Units	Downflow Units	Upflow Units	$/SCOP
CRAC, Air-Cooled	1	65,000	2.20	2.09	N/A	N/A	$7,181.33
	65,000	240,000	2.10	1.99	N/A	N/A	$7,715.73
	240,000	760,000	1.90	1.79	N/A	N/A	$11,110.13
CRAC, Air-Cooled with Economizer	1	65,000	2.20	2.09	6.58	6.25	$12,152.77
	65,000	240,000	2.10	1.99	6.28	5.95	$13,057.12
	240,000	760,000	1.90	1.79	5.67	5.36	$18,801.37
CRAC, Water-Cooled	1	65,000	2.60	2.49	N/A	N/A	$18,628.16
	65,000	240,000	2.50	2.39	N/A	N/A	$32,837.67
	240,000	760,000	2.40	2.29	N/A	N/A	$62,303.50
CRAC, Water-Cooled with Economizer	1	65,000	2.55	2.44	4.86	4.65	$19,714.89
	65,000	240,000	2.45	2.34	4.67	4.46	$34,751.50
	240,000	760,000	2.35	2.24	4.48	4.27	$65,931.00
CRAC, Glycol-Cooled	1	65,000	2.50	2.39	N/A	N/A	$18,575.38
	65,000	240,000	2.15	2.04	N/A	N/A	$32,791.17
	240,000	760,000	2.10	1.99	N/A	N/A	$62,303.50
CRAC, Glycol-Cooled with Economizer	1	65,000	2.45	2.34	4.65	4.44	$19,656.86
	65,000	240,000	2.10	1.99	3.99	3.78	$34,700.33
	240,000	760,000	2.05	1.94	3.89	3.68	$65,931.00

References:

1. ASHRAE 127-2007
2. CFR Title 10, Volume 3, Chapter II, Subchapter D, Part 431, Subpart F
3. Chapter 3 of the Technical Support Document for the DOE CRAC efficiency final rule making, https://www.regulations.gov/document?D=EERE-2011-BT-STD-0029-0039

Changes from Recent Filing:

1. New prescriptive measure

Assumptions:

1. The DOE standard does not apply to CRAH units, horizontal flow units, or ceiling-mounted units; therefore, these units are excluded from this prescriptive rebate.
2. The equipment type of CRAC, Air-Cooled with Economizer is not in the DOE standard, but are included in the prescriptive rebate since these are in the market and have a large market share.
3. Minimum SCOP requirements for CRAC, Air-Cooled with Economizer are assumed to be the same as CRAC, Air-Cooled, because market research showed that these types of unit's don't have additional coils for economization. Therefore, no reduction in minimum SCOP is needed to account for the additional flow resistance through the unit.
4. Proposed SCOP ratings must be based on the same outdoor operating conditions used in the rating standard (Reference 1), i.e. air-cooled units are rated at the same OAT, water-cooled units are rated at the same entering and leaving water temperatures, and glycol-cooled units are rated at the same entering and leaving glycol temperatures.
5. Proposed SCOP ratings must be based on actual indoor operating conditions in the data center, i.e. RAT and RH. Credits or penalties for operating the data center above or below the RAT rating condition of 75F and RH rating condition of 45% are part of the savings for this prescriptive rebate. For Glycol Cooled CRAC units, credits or penalties for operating with a propylene glycol solution above or below the rating condition of 40% are also part of the savings for this prescriptive rebate.
6. Credit for being able to run CRAC fans at reduced speeds is not given in the prescriptive savings, because speed controls are standard on all units with EC fans, i.e. new CRAC units. Since units with EC fans have the necessary controls to reduce speed below 100%, the fan speed in the baseline for a new CRAC unit would be the same as the fan speed in the new, proposed CRAC unit.
7. The rated size for units in economization is required since most Water-Cooled and Glycol-Cooled CRAC units have a separate coil for economization, and this coil typically has a different cooling capacity than the evaporator coil. For Air-Cooled units with Economizer, the rated size in economization is likely the same as non-economization, since these units only have one coil for economization and refrigerant evaporation.
8. Economization hours are based on the OA conditions outlined in rating Test D of the rating standard (Reference 1), and an assumed approach temperature of 15 °F for cooling towers and dry coolers.
9. The efficiency curves used for adjusting the minimum SCOP values for economization are from past M&V projects or previous TAs. The efficiency curves are used to find the difference in efficiency at the outdoor operating conditions in Test A and Test D of the rating standard (Reference 1). This difference is then applied to the DOE minimum SCOP values to obtain the minimum SCOP values for economizer operation.
10. CRAC cost from taken from the DOE's data is only for downflow units (Reference 3), but it is assumed that the incremental cost calculated from this data would be the same for upflow units.
11. The DOE's cost data shows negative incremental cost as efficiency improves for smaller Water-Cooled and Glycol-Cooled CRAC units (Reference 3). The DOE mentioned that the negative values were likely due to an insufficient amount of data and the result did not make sense. Therefore, this was corrected here by using ratios of the known, positive incremental cost to correct the DOE's negative incremental cost.
12. The incremental cost for CRAC, Air-Cooled with Economizer is based on a cost multiplier calculated from past Xcel Energy projects. The DOE's cost multiplier was not used, since it did not account for the additional labor and components associated with a CRAC, Air-Cooled with Economizer. The DOE value only accounted for an additional coil, but air-cooled units with economizers don't have additional coils. These units usually have additional mechanical components (e.g. pumps), and these components require more labor beyond connecting a second coil that is housed within the same CRAC enclosure.

11.12 Plate & Frame HX

Algorithms

$$Customer\ kWh = \left(A \times T_{WB\ Onset}{}^{2} + B \times T_{Balance}{}^{2} + C \times T_{WB\ Onset} \times T_{Balance} + D \times T_{WB\ Onset} + E \times T_{Balance} + F\right) \times \left(\frac{Cooling\ Hrs\ No\ Econ}{G\_EFLH}\right) \times \left(\frac{IPLV_{Eff}}{IPLV_{Baseline}}\right) \times \left(\frac{PF\ Tons\ Offset}{100}\right)$$

$$Customer\ kW = \frac{PF\ Tons\ Offset}{IPLV_{Baseline}}$$

$$\text{Customer PC kW} = CF \times Customer\ kW$$

$$PF\ Tons\ Offset = \left(\frac{Load_{onset}}{\left(T_{DB\ Design} - T_{Balance}\right)}\right) \times T_{WB\ to\ MCDB} + \left(Load_{onset} - \left(\frac{Load_{onset}}{\left(T_{DB\ Design} - T_{Balance}\right)}\right) \times T_{DB\ Design}\right)$$

$$Incremental\ Cost = PF\ Tons\ Offset \times Incremental\ Cost\ per\ Ton$$

Variables

$IPLV_{Baseline}$	0.570	Baseline Chiller IPLV (kW/ton)
$T_{DB\ Design}$	92	Design dry-bulb temperature for cooling (°F)
$T_{WB\ to\ MCDB}$	30.505	Mean Coincident Dry Bulb Temperature (as determined from binned TMY3 data for the location) corresponding to the Onset Wet Bulb Temperature provided by the customer
A	3.254	Coefficient from regression
B	0	Coefficient from regression
C	0	Coefficient from regression
D	5958.821	Coefficient from regression
E	0	Coefficient from regression
F	-47208.137	Coefficient from regression
G_EFLH	8760	Coefficient from regression
Coincidence Factor (CF)	0%	Coincidence Factor, the probability that peak demand of the equipment will coincide
Cooling Hrs No Econ	8760	Equivalent Full Load Hours. The equivalent number of hours that the equipment would be running at full load over the course of the year.
Incremental Cost	See Table #.3.0	Incremental cost incurred for purchasing a plate and frame heat exchanger for free cooling
Lifetime	20	Measure life is taken at 20 years for all cooling equipment. (Reference 1) (years)

Customer Inputs	**M&V Verified**	
$IPLV_{Eff}$	Yes	Efficient Chiller IPLV (kW/ton)
$T_{WB\ Onset}$	No	Wet Bulb Temperature at which waterside economizer is activated (°F)
$Capacity_{HX}$	Yes	Cooling capacity of plate and frame heat exchanger (tons)
$T_{balance}$	No	Building Balance Point Temperature, the outside air dry bulb temperature at which there is no cooling load. Customer input for all segments except Industrial and Data Center (20°F default); Not used for Industrial and Data Centers since Load (OADB) = Load (°F)
$Load_{onset}$	No	Cooling load at onset wet-bulb temperature ($T_{WB\ Onset}$) (tons)
County	Yes	County where project is located
Market segment	Yes	Project facility type

Table #.3.0 - Incremental Capital Costs

HEx Tons ("PF Tons Offset")	Incremental Cost $/ton
65	$646
80	$830
120	$736

References:

1. ASHRAE, 2007, Applications Handbook, Ch. 36, table 4, Comparison of Service Life Estimates
2. Data from historic Xcel Energy Custom Efficiency cooling tower projects

Assumptions:

No airside economizers are in operation
Heat exchanger is installed in parallel with the chiller and additional cooling towers are not required

Description

Prescriptive rebates will be offered for installation of plate & frame heat exchangers on existing chiller systems to allow cooling towers to provide "free cooling" in lieu of chiller operation. Eligible systems will NOT have air-side economizers installed.

11.13 DCV

Should Pull from One Tab?

Algorithms

$$Customer\ kWh = Size \times FLV_{DX} \times (Base\_OA\_Load - Reduced\_OA\_Load) \times Cooling\_RTU\_Op\_Hours$$

$$Customer\ Coinicident\ kW = Size \times FLV_{DX} \times (Base\_OA\_Load - Reduced\_OA\_Load) \times Cooling\_RTU\_Op\_Hours$$

Variables

FLV_DX	1.2	The total operating hours that the RTU runs in mechanical cooling mode, based on all
Baseline_OA_Load	10%	Ratio of outside air ventilation load of the RTU to the peak cooling load.
Reduced_OA_Load	5%	Ratio of outside air ventilation load of the RTU to the peak cooling load.
Cooling_RTU_OP_Hours	1.2	Efficiency of a DX unit when operating, in kW/ton. For use in the DX Economizers with
Measure Life	15	Years, assumed to be equal to the Xcel Energy's standard measure life for projects
CFM/Ton	400	Assumption of CFM per Ton of cooling capacity
Coincidence Factor	90%	For all measures except Chiller VFD Retrofits
Incremental Cost	$1,500	Each Implementation, MN an IL Technical Resource Manual
NTG	100%	

Customer Inputs	**M&V Verified**	
Size	Yes	The equipment capacity in tons.
Economizer	Yes	Customer Has Economizer

References:

Changes from Recent Filing:

11.14 Commercial AC Switch

Algorithms

$$Customer\ kWh = (Baseline_{kW} - Proposed_{kW}) \times Eq.Hours$$

$$Customer\ Coincident\ kW = Eq.Baseline\_Efficiency \times I\_Equipment\_Tons \times Eq.Coincidence\_Factor$$

$$Customer\ kW = Eq.Baseline\_Efficiency \times I\_Equipment\_Tons$$

Variables

I_Equipment_Tons	Customer Input	AC unit tons.
Eq.Baseline_Efficiency_Single	1.091	Single stage AC unit efficiency in kW/ton.
Eq.Baseline_Efficiency_Multi	1.091	Multi stage AC unit efficiency in kW/ton.
Eq.Hours_Single	0.250	Full Load Hours of Operation for a single-stage smart switch.
Eq.Hours_Multi	0.209	Full Load Hours of Operation for a multi-stage smart switch.
Eq.Coincidence_Factor_Single	0.180	Single Stage Coincidence Factor. Percentage of the kW savings that occur during the annual
Eq.Coincidence_Factor_Multi	0.151	Mutli-Stage Coincidence Factor. Percentage of the kW savings that occur during the annual
Life_BusSS	15	Length of time the switch will be operational.
NTG	1.000	Net-to-Gross factor for Saver's Switch will be 100% as customers would not have the ability to

Customer Inputs	**M&V Verified**	
AC unit tons	Yes	
Air conditioner single-stage or multi-stage	Yes	
Stage 1 and stage 2 tons (Multi-stage units only)	Yes	

References:

1. Updated PC kW & kWh savings per unit per event for smart switches. As a result other values such as coincidence factor and hours also updated.
2. Updated algorithms to match current practices.

Changes from Recent Filing:

None

Table 1.A Deemed Baseline Efficiency - Split Systems & Single Packages

Equipment	Efficiency	(Minnesota Energy Code 2015 - Tables C403.2.3 (1), C403.2.3(2), C403.2.3(3))	
		SEER/IEER	EER
DX Units < 5.4 tons	Baseline Efficiency	13.0	11.1
DX Units 5.4 - 11.3 tons	Baseline Efficiency	11.2	11.0
DX Units 11.4 - 19.9 tons	Baseline Efficiency	11.0	10.8
DX Units 20 - 63.3 tons	Baseline Efficiency	9.9	9.8
DX Units ≥ 63.3 tons	Baseline Efficiency	9.6	9.5
Water-Source Heat Pumps	Baseline Efficiency	13.3	12.0
Mini-Split Heat Pump (air-cooled, cooling mode) & Minisplit AC	Baseline Efficiency	14.0	8.4
PTAC	Baseline Efficiency	14.4	12.2

Table 1.B Deemed Baseline Efficiency -Water Chilling Packages

Equipment	Efficiency	Table C403.2.3(7), Minnesota Energy Code 2015			
		SEER/IEER	EER	FLV (kW/ton)	IPLV (kW/ton)
Scroll/Screw chiller < 75 tons	Baseline Efficiency			0.780	0.630
Scroll/Screw chiller 75 - 150 tons	Baseline Efficiency			0.775	0.615
Scroll/Screw chiller 150 - 300 tons	Baseline Efficiency			0.680	0.580
Scroll/Screw chiller ≥ 300 tons	Baseline Efficiency			0.620	0.540
Scroll/Screw chiller 300 - 600 tons	Baseline Efficiency				
Scroll/Screw chiller ≥ 600 tons	Baseline Efficiency				
Centrifugal Chillers < 150 tons	Baseline Efficiency at AHRI Conditions			0.634	0.596
Centrifugal Chillers 150 - 300 tons	Baseline Efficiency at AHRI Conditions			0.634	0.596
Centrifugal Chillers 300 - 400 tons	Baseline Efficiency at AHRI Conditions				
Centrifugal Chillers 300 - 600 tons	Baseline Efficiency at AHRI Conditions			0.576	0.549
Centrifugal Chillers 400 - 600 tons	Baseline Efficiency at AHRI Conditions				
Centrifugal Chillers ≥ 600 tons	Baseline Efficiency at AHRI Conditions			0.570	0.539
Air-Cooled Chillers < 150 tons	Baseline Efficiency	12.500	9.562		
Air-Cooled Chillers ≥ 150 tons	Baseline Efficiency	12.750	9.562		

Notes:

* Bold values indicates direct sourcing to ASHRAE 90.1-2010, otherwise estimated by multiplying SEER or dividing EER by the following:
+ 0.85 for DX Units < 5.4 tons and PTAC's
+ 0.90 for WSHP's
+ 0.60 for Mini-Splits for the purposes of this illustration. A 3rd degree polynomial curve fit, derived from the AHRI database, will be used for actual savings calculations
* High Efficiency SEER/IEER and EER values are supplied by Customer.
* ARI rated efficiency is converted to Standard efficiency as per ASHRAE 90.1-2010
* Values for Centrifugal Chillers assumed to be at ARI rating conditions of 85 °F condensing temperature, 44 °F chilled water temperature, and 3 gpm/ton chilled water flow. Reference ASHRAE 90.1-2010
* Values for PTAC units are based on 3/4 ton new construction units. Reference ASHRAE 90.1-2010

Table 1.C Equivalent Full Load Hours by Building Type (Ref: Minnesota TRM Version 3.0)

Building Type	Zone 1 EFLH	Zone 2 EFLH	Zone 3 EFLH
Convenience Store	647	825	986
Education - Community College/University	682	782	785
Education - Primary	289	338	408
Education - Secondary	484	473	563
Health/Medical - Clinic	558	738	865
Health/Medical - Hospital	663	1089	1298
Lodging	401	606	754
Manufacturing	347	472	589
Office-Low Rise (< 25,000 ft^2, 1 - 2 stories)	257	359	446
Office-Mid Rise (25,000 - 250,000 ft^2, 3 - 8 stories)	373	529	651
Office-High Rise (> 250,000 ft^2, > 8 stories)	669	1061	1263
Restaurant	347	535	652
Retail - Large Department Store	462	588	686
Retail - Strip Mall	307	441	574
Warehouse	164	343	409
Data Center	8,760	8,760	8,760
Process Load	5,840	5,840	5,840

NOTE: Zone 1 (Northern MN), Zone 2 (Central), and Zone 3 (Southern MN, Twin Cities)

Table 1.D Incremental Costs Per Ton (Ref: Minnesota Technical Reference Manual Version 3.1)

Equipment	Incremental Cost per Ton ($ per ton)
DX Units < 5.4 tons	165
DX Units 5.4 - 11.3 tons	150
DX Units 11.4 - 19.9 tons	140
DX Units 20 - 63.3 tons	125
DX Units ≥ 63.3 tons	110
Water-Source Heat Pumps	150
PTAC	250
Scroll/Screw chiller < 75 tons	130
Scroll/Screw chiller 75 - 150 tons	90
Scroll/Screw chiller 150 - 300 tons	90
Scroll/Screw chiller ≥ 300 tons	40
Centrifugal Chillers < 150 tons	130
Centrifugal Chillers 150 - 300 tons	85
Centrifugal Chillers 300 - 600 tons	85
Centrifugal Chillers ≥ 600 tons	40
Air-Cooled Chillers < 150 tons	110
Air-Cooled Chillers ≥ 150 tons	110
Chiller VFD Retrofit	72
Mini-Split Heat Pump	293
Mini-Split Air Conditioner	246

Table 2.A Bin Hours and Weather Conditions

OADB (°F)	Hours	Humidity Ratio (lb_m/lb_m)	Enthalpy (BTU/lb_m)	MCWB (°F)
104	0	0.00000	0.00	0.00
102	0	0.00000	0.00	0.00
100	0	0.00000	0.00	0.00
98	3	0.01641	41.84	77.74
96	4	0.01604	40.85	76.73
94	17	0.01602	40.20	76.01
92	15	0.01503	38.56	74.25
90	32	0.01541	38.48	74.15
88	47	0.01455	37.04	72.52
86	31	0.01420	36.28	71.79
84	76	0.01421	35.89	71.40
82	120	0.01302	34.12	69.40
80	146	0.01271	33.27	68.36
78	172	0.01200	32.03	66.87
76	327	0.01167	31.03	65.57
74	261	0.01096	29.63	63.78
72	272	0.01127	29.50	63.61
70	265	0.01025	27.90	61.44
68	148	0.01023	27.50	60.84
66	299	0.00969	26.54	59.50
64	272	0.00934	25.69	58.24
62	241	0.00796	23.69	55.25
60	216	0.00749	22.68	53.62
58	299	0.00680	21.35	51.38
56	214	0.00635	20.24	49.46
54	222	0.00582	19.17	47.49
52	211	0.00564	18.49	46.20
50	117	0.00517	17.61	44.49
48	221	0.00528	17.38	44.02
46	222	0.00499	16.58	42.46
44	207	0.00445	15.50	40.21
42	265	0.00434	14.89	38.90
40	334	0.00394	13.87	36.64
38	216	0.00340	12.66	33.77
36	221	0.00315	11.93	31.98
34	294	0.00309	11.36	30.61
32	167	0.00278	10.68	28.96
30	266	0.00256	10.06	27.47
28	240	0.00225	9.25	25.40
26	237	0.00194	8.45	23.27
24	241	0.00182	7.85	21.69
22	305	0.00156	6.97	19.22
20	226	0.00135	6.12	16.79
18	179	0.00122	5.51	15.00
16	159	0.00109	4.89	13.13
14	52	0.00100	4.43	11.68
12	91	0.00092	3.98	10.26
10	71	0.00089	3.49	8.71
8	75	0.00076	2.81	6.52
6	57	0.00070	2.33	4.92
4	70	0.00062	1.63	2.54
2	40	0.00049	0.87	-0.09
0	45	0.00044	0.34	-1.95
-2	45	0.00037	-0.24	-4.01
-4	33	0.00037	-0.57	-5.20
-6	37	0.00034	-0.92	-6.46
-8	31	0.00030	-1.49	-8.58
-10	36	0.00027	-1.95	-10.28
-12	12	0.00025	-2.51	-12.37
-14	22	0.00023	-3.17	-14.87
-16	8	0.00020	-3.64	-16.68
-18	3	0.00017	-4.29	-19.19
-20	1	0.00016	-4.85	-21.38
-22	2	0.00015	-5.12	-22.42
-24	2	0.00015	-5.49	-23.88

Table 2.B Bin Hours WB and Mean Coincident Dry Bulb Temps

MCDB (°F)	WB (°F)	Hours
88.5	82	2
90.2	80	27
86.9	78	53
83.9	76	73
81.4	74	96
78.7	72	169
77.7	70	197
75.1	68	255
73.6	66	360
70.9	64	367
70.0	62	296
67.6	60	338
65.8	58	254
62.9	56	250
60.8	54	261
57.9	52	260
55.1	50	296
53.4	48	263
50.2	46	246
48.2	44	278
46.2	42	260
43.4	40	271
41.7	38	273
39.0	36	209
36.0	34	301
34.4	32	251
32.4	30	272
30.8	28	297
28.3	26	219
26.3	24	299
24.0	22	239
21.9	20	195
19.8	18	227
17.8	16	218
15.7	14	155
13.6	12	103
11.1	10	104
8.8	8	61
7.0	6	75
4.8	4	46
2.6	2	45
0.5	0	46
-1.5	-2	39
-3.6	-4	63
-5.4	-6	35
-8.0	-8	43
-9.7	-10	28
-12.4	-12	13
-14.6	-14	16
-16.1	-16	8
-18.6	-18	3
-20.9	-20	1
-22.4	-22	3
-24.0	-24	1

12.1 Water Heater

Algorithms

$$Customer\ Dth = (Quantity \times \frac{BTUH_{Input}}{Quantity * BTUH_{Input} + Other\ WH\ BTUH} \times Density \times Cp \times Volume\ Daily\ SqFt\ Usage \times Days\ Year \times (Sq\ Ft\ Served)/1000 \times (Tsetpoint - Tsupply) \times \left(\frac{1}{EffStandard} - \frac{1}{EffHigh}\right) + Quantity \times Gallons_{Storage} \times \left(\frac{SL_{Base}}{EffStandard} - \frac{SL_{New}}{EffHigh}\right))/1000000$$

Variables

density	8.33	Density of water, lbs/gal
C_p	1	Specific heat of water, Btu / lb - F
Volume_Daily_SqFt_Usage	See Table 12.1.1	Average daily hot water consumption [gallons / 1,000 ft2 / day].
Days_Year	See Table 12.1.1	Applicable days per year of building operation
T_setpoint	140	Water heater setpoint, deg F (Ref 27).
T_supply	58	Supply temperature of city water to water heater, deg F (Ref 27).
Eff_Rating_Standard	See Table 12.2.0	Efficiency Rating of standard replacement water heater, Thermal Efficiency
SL_base	13.21	Standby Losses for baseline storage water heater, BTUH per gallon of storage (Ref 26)
SL_new	8.9	Standby Losses for efficient water heater, BTUH per gallon of storage (Ref 26)
Incremental Cost	See Table 12.2.1	Incremental cost of efficient water heater over standard water heater.
Measure Life	See Table 12.1.0	

Customer Inputs	**M&V Verified**	
SqFt_Served	Yes	Number of Square feet served by water heater in thousands of square feet, site specific.
Eff_Rating_High	Yes	Efficiency Rating of high efficiency replacement water heater, Thermal Efficiency
Building type	Yes	Facility type from picklist
Gallons Storage	Yes	Size of storage tank in gallons, 0 if tankless
BTUH input	Yes	BTUH of proposed water heater
Other Water Heater BTUH Input	Yes	BTUH input of other water heaters not being replaced

Table 12.1.1 Annual Hot Water Use Data (Ref 29 and 31)

Building Type	Applicable Days/Year	Gallons / 1,000 ft2 / day
Small Office	250	2.3
Large Office	250	2.3
Fast Food Restaurant	365	549.2
Sit-Down Restaurant	365	816.0
Retail	365	2.0
Grocery	365	2.2
Warehouse	250	1.0
Elementary School	200	5.7
Jr. High/High School/College	200	17.1
Health	365	342.0
Motel	365	100.0
Hotel	365	30.8
Other Commercial	250	0.7
Industrial	Site Specific	Site Specific

Table 12.2.1.a: Incremental Cost per Nameplate Input BTUH for Storage Water Heater per 100 Gallons of Storage (Ref 30)

	$/BTUH
Fast Food Restaurant	$0.0326
Sit-Down Restaurant	$0.0056
Elementary School	$0.0056
Junior High School	$0.0085
Motel	$0.0056
Apartment Building	$0.0340
Fitness Center	$0.0085
Other	$0.0144

Table 12.2.1.b: Incremental Cost per Nameplate Input BTUH for Tankless Water Heater

	$/BTUH
Fast Food Restaurant	$0.0105
Sit-Down Restaurant	$0.0044
Elementary School	$0.0044
Junior High School	-$0.0049
Motel	-$0.0080
Apartment Building	$0.0105
Fitness Center	$0.0037
Other	$0.0029

References:

1. 1999 Minnesota Energy Code - Chapter 7676.1100 Subpart 3D, 4A
2. Centerpoint TRM
3. International Energy Conservation Code (IECC) 2015 Table C403.2.3 (4)
4. ASHRAE HVAC Systems and Equipment 2008 pg 15.1
5. Whole Building Design Guide for US Army. Tech Note 14: Overhead Radiant Heating <https://www.wbdg.org/ccb/ARMYCOE/COETN/technote14.pdf>
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49. Custom DCV Projects, 2010-2011
50. MN Lighting Efficiency Tech Assumption , Tab "Forcast Market Segment".
51. 2011 Tetratech Program Evaluation

Changes from Recent Filing:

12.2 Boiler

Algorithms

$$Customer\ Dth = Input\ Capacity \times Alt \times (\frac{Effh}{Effb} - 1) \times EFLH$$

Variables

Alt	1	Altitude Adjustment factor to adjust the sea level manufacturer's rated input for altitude effects. No adjustment for near sea-level altitude.
EFFb	See Table 12.2.0	Efficiency of Baseline equipment
EFFh	See Table 12.2.2	Rated efficiency used for non-condensingg boilers. Deemed efficiency used for condensing boilers.
EFLH	See Table 12.3.0	Based on Bin Analysis assuming 30% oversizing for boiler plant. See "Forecast Boiler Op Hours " tab.
Conversion Factor	1000000	Conversion from BTU to Dth
Incremental Cost	See Table 12.1.2	Incremental cost of efficient boiler or furnace over standard equipment.
Measure Life	See Table 12.1.0	

Customer Inputs	**M&V Verified**	
Input Capacity	Yes	Rated input BTUH nameplate data for the new boiler, furnace, unit heater, or water heater.
Rated Efficiency	Yes	Rated efficiency of purchased boiler, provided by customer.
Use	Yes	Use of boiler: space heating, domestic water, or both.

Table 12.1.2.a Hot water boiler costs (Ref 23)

Input Capacity Range	High Efficient - Condensing	Baseline to High Efficient - Non Condensing Incremental Cost	Baseline to High Efficient - Condensing Incremental Cost
0 - 0.499 MMBTUH	$4,600	$500	$1,600
0.5 - 0.999 MMBTUH	$11,200	$4,000	$6,200
1 - 1.999 MMBTUH	$15,000	$4,400	$7,700
2 - 3.999 MMBTUH	$26,500	$5,000	$14,500
4 - 5.999 MMBTUH	$53,000	$10,000	$29,000
6 - 7.999 MMBTUH	$79,500	$15,000	$43,500
8 -9.999 MMBTUH	$106,000	$20,000	$58,000

Table 12.1.2.b Steam boiler costs (Ref 23)

Boiler Input Capacity Range	Baseline	High Efficient	Incremental
Low Pressure Steam Boiler; 0 - 0.499 MMBTUH	$2,920	$4,240	$1,320
Low Pressure Steam Boiler; 0.5 - 4.999 MMBTUH	$5,275	$8,443	$3,168
Low Pressure Steam Boiler; 5 - 9.999 MMBTUH	$18,757	$35,257	$16,500
High Pressure Steam Boiler; 0 - 0.499 MMBTUH	$3,211	$4,531	$1,320
High Pressure Steam Boiler; 0.5 - 4.99 MMBTUH	$5,802	$8,970	$3,168
High Pressure Steam Boiler; 5 - 9.999 MMBTUH	$20,633	$37,133	$16,500

Table 12.2.2 Boiler Efficiency (Ref 25 and 47)

Boiler Type	EFFh
Condensing	90%
Non-Condensing	Customer Input Rated Efficiency

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3. International Energy Conservation Code (IECC) 2015 Table C403.2.3 (4)
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51. 2011 Tetratech Program Evaluation

Changes from Recent Filing:

Removed 5% adjustment factor for condensing boilers and deemed proposed efficiency at 90%
EFLH for space heating adjusted to reflect the MN TRM
Baseline Efficiency for Steam Boilers lowered from 80% tro 79%

12.3 Furnace

Algorithms

$$Customer\ Dth = Input\ Capacity \times Alt \times (\frac{Effh}{Effb} - 1) \times EFLH/1000000$$

Variables

Alt	1	Altitude Adjustment factor to adjust the sea level manufacturer's rated input for altitude
EFFb	See Table 12.2.0	Efficiency of Baseline equipment
EFLH	See Table 12.3.0	
Conversion Factor	1000000	Conversion from BTU to Dth
Incremental Cost	See Table 12.1.3	Incremental cost of efficient boiler or furnace over standard equipment.
Measure Life	See Table 12.1.0	

Customer Inputs	**M&V Verified**	
Input Capacity	Yes	Rated input BTUH nameplate data for the new boiler, furnace, unit heater, or water heater.
EFFh	Yes	Efficiency of purchased boiler, provided by customer. See Table 1 for minimum qualifying efficiency for higher efficiency equipment.
Use	Yes	Use of boiler: space heating, domestic water, or both.

Table 12.1.3 (Ref 2)	**Standard Unit Cost**	**High Efficient Unit**	**Incremental Cost**		
New Energy Star Furnace => 90% AFUE, < 92% AFUE	$1,866.40	$3,120.70	$1,254.30		
New Energy Star Furnace => 92% AFUE, < 94% AFUE	$1,866.40	$3,208.29	$1,341.89		
New Energy Star Furnace => 94% AFUE, < 96% AFUE	$1,866.40	$3,295.88	$1,429.48	$2,858.96	$2,858.955
New Energy Star Furnace => 94% AFUE	$1,866.40	$3,383.47	$1,517.07		

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49. Custom DCV Projects, 2010-2011
50. MN Lighting Efficiency Tech Assumption , Tab "Forcast Market Segment".
51. 2011 Tetratech Program Evaluation

Changes from Recent Filing:

12.5 Boiler Tune Up

Algorithms

$$Customer\ Dth = Input\ Capacity \times Alt \times (\frac{Effh - Adj}{Effb} - 1) \times EFLH$$

Variables

Alt	1	Altitude Adjustment factor to adjust the sea level manufacturer's rated input for altitude
Effb	See Table 12.2.0	Efficiency of Baseline equipment.
Effh	See Table 12.2.0	Efficiency of Boiler after the tune-up
EFLH	See Table 12.3.0	Based on Bin Analysis assuming 30% oversizing for boiler plant. (Ref 28)
Measure Life	See Table 12.1.0	

Customer Inputs	**M&V Verified**	
Input Capacity	Yes	Rated input BTUH nameplate data for the boiler
Use	Yes	Use of boiler: space heating, domestic water, or both.
Cost	Yes	Cost of boiler tuneup

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1. 1999 Minnesota Energy Code - Chapter 7676.1100 Subpart 3D, 4A
2. Centerpoint TRM
3. International Energy Conservation Code (IECC) 2015 Table C403.2.3 (4)
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51. 2011 Tetratech Program Evaluation

Changes from Recent Filing:

EFLH for space heating adjusted to reflect the MN TRM

12.4 Unit Heater

Algorithms

$$Unit\ Heater\ Savings\ (Dth) = Input\ Capacity \times Alt \times (\frac{EFFh}{EFFb} - 1) \times EFLH\_UH \times (Oversize\ Factor_{heat}) \div 1000000$$

$$Infrared\ Heater\ Savings\ (Dth) = Dth\ Base\ Infrared - Dth\ Eff\ Radiant$$

$$Dth\ Base\ Infrared = \left(\frac{Infrared\ Input\ Capacity \times Alt}{Infrared\ Size\ Factor}\right) \times Oversize\ Factor_{heat} \times EFLH_{UH} \times \left(\frac{1\ Dth}{1000000\ BTU}\right) - Dth_{fan}$$

$$Dth\ Eff\ Infrared = Infrared\ Input\ Capacity \times Alt \times Oversize\ Factor\_heat \times EFLH\_UH \times (\frac{1Dth}{1000000\ BTU})$$

$$EFLH_{UH} = \frac{HDD_a \times {T_{indoor}}^2 - HDD_b \times T_{indoor} + HDD_c}{T_{indoor} - T_{design}}$$

$$FLH = \frac{HDD_a \times {T_{indoor}}^2 + HDD_b \times T_{indoor} + HDD_c}{T_{indoor} - T_{offset}} \times 24 \times \%conditioned$$

$$Dth_{fan} = Fan\_kW \times 3412 \times FLH \div 1000000$$

Variables

Alt	1	Altitude Adjustment factor to adjust the sea level manufacturer's rated input for altitude effects.
HP/BTUh	0.000002968	Average axial/propeller/centrifugal fan power (rated) per BTU/h of heating output. Taken from manufacturer data for 38 unit heaters from Trane and Sterling; Applies to Infrared Heaters only
Oversize Factor_heat	0.9	Factor to account for design oversize commonly found on unit heater installations. Reference 1
T_design	See Table 12.1.4	Winter Design temperature for the given location. Reference 2.
LF	0.8	Design load factor of fan motor, deemed based on typical engineering assumption
EFFb	80%	Thermal efficiency of the baseline, non-power-vented, code-compliant unit heater. Reference 3.
EFFh	See Table 12.2.0	Thermal efficiency of the new, efficient unit heater
Heat_eff_infrared	80%	Thermal efficiency of the new, infrared heater. = 0.80, same as baseline because the infrared heaters do not have specific combustion efficiency improvements over the baseline unit heater, their savings are all from infrared (radiation) heat transfer versus convection. Also, Ref 5 uses this value.
Infrared Size Factor	0.85	Factor to account for the fact that infrared heaters should be designed smaller than an equivalent standard unit heater due to infrared (radiation) heat transfer being more effective at producing thermal comfort. This also accounts for the lower room temperature afforded by infrared heaters. = 0.85 (Ref 4)
HDD_a	See Table 12.1.4	Polynomial Constants used in calculating HDD based on TMY3 weather data and design indoor temperature. HDD is proportional to the indoor temperature based on the formula HDD = a * Tin^2 + b * Tin + c
HDD_b	See Table 12.1.4	Polynomial Constants used in calculating HDD based on TMY3 weather data and design indoor
HDD_c	See Table 12.1.4	Polynomial Constants used in calculating HDD based on TMY3 weather data and design indoor temperature. HDD is proportional to the indoor temperature based on the formula HDD = a * Tin^2 + b * Tin + c
T-Offset	See Table 12.1.4	Difference between the maximum heating degree day and the indoor design temperature.
Mtr_eff	29.60%	Average efficiency of 6 unit heater fans, calculated by taking the manufacturer-provided (Reznor, Sterling, and Trane) current draw to calculate power consumption and working backwards with the rated motor power and an assumed load factor of 0.8 to compute the efficiency for each fan and then taking the average of all of the fans. = 0.296 and includes both axial and centrifugal fans.
Conversion Factor	0.746	Conversion factor from HP to kW
Conversion Factor	1000	Conversion factor from kBTU/h to BTU/h
Conversion Factor	3412	Conversion factor from kW to BTU/h
Measure Life	See Table 12.1.0	Refer to table for measure life.
Incremental Cost	Table 10	Incremental cost of efficient unit heater over standard power vented unit heater.

Customer Inputs	**M&V Verified**	
Input capacity	Yes	Rated Input Capacity of the new non-infrared heater in BTU/h
Infrared Input Capacity	Yes	Rated Input Capacity of the new infrared heater in BTU/h
%conditioned	Yes	Percentage of the time during heating season the space is heated
T_indoor	Yes	Space temperature set point of space being heated

Table 12.1.4 HDD Estimation Constants and Site Weather Data (Ref 10)

Climate Zone	HDD_a	HDD_b	HDD_c	T_design	T-Offset
Minnesota	2.51	(54.61)	679.14	(16.00)	(12.40)

Table 12.2.4 Unit Heater and Radiant Heater Costs (Ref 7)

	$/kBTUh (output)	Incremental Cost
Baseline Unit Heater	$8.42	N/A
Power-vented Unit Heater (83%)	$10.04	$1.62
Condensing Unit Heater (90%)	$18.47	$10.05
Infrared Heater (uses input kBTU/h)	$9.45	$1.03

References:

1. 1999 Minnesota Energy Code - Chapter 7676.1100 Subpart 3D, 4A
2. Centerpoint TRM
3. International Energy Conservation Code (IECC) 2015 Table C403.2.3 (4)
4. ASHRAE HVAC Systems and Equipment 2008 pg 15.1
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51. 2011 Tetratech Program Evaluation

Changes from Recent Filing:

12.6 Steam Traps

Algorithms

$$Customer\ (Dth) = LeakRate \times Leak\ Hours \times \frac{BTU\ Per\ Pound}{EFFb} / 1000000$$

Variables

Leak_Rate	5	Leakage rate for low pressure steam traps in pounds of steam per hour.(Reference 20)
	11	Leakage rate for high pressure steam traps in pounds of steam per hour.(Reference 20)
Leak_Hours	See Table 12.1.6	Annual hours boiler lines are pressurized, based on customer-provided system type.
Effb	See Table 12.2.0	Efficiency of steam boiler
BTU_Per_Pound	1064	Loss in btu/lb for Steam traps in Low Pressure Applications: 1164 BTU per pound for lost to atmosphere, 964 BTU per pound lost to condensate. Assume 50/50 mix = 1064 BTU per pound. (Reference 20)
	1081	Loss in btu/lb for Steam traps in High Pressure Applications: 1181 BTU per pound for lost to atmosphere, 981 BTU per pound lost to condensate. Assume 50/50 mix = 1081 BTU per pound. (Reference 20)
Measure Life	See Table 12.1.0	

Customer Inputs	**M&V Verified**	
Incremental Cost	No	Cost of replacing or repairing steam traps, per trap, provided by the customer.
Steam Pressure	Yes	Steam pressure, low or high.
Use	Yes	Use of steam system: space heating, domestic water, or both.

Table 12.1.6 Annual Leak Hours - Steam Traps (Ref 28)

Use	Hours
Space Heating	5,037
Domestic Water Heating	8,760
Space and Domestic Water Heating	8,760

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1. 1999 Minnesota Energy Code - Chapter 7676.1100 Subpart 3D, 4A
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49. Custom DCV Projects, 2010-2011
50. MN Lighting Efficiency Tech Assumption , Tab "Forcast Market Segment".
51. 2011 Tetratech Program Evaluation

Changes from Recent Filing:

12.7 Pipe Insulation

Algorithms

$$Customer\ (Dth) = LFT \times Hrs \times (BTU\ Per\ Foot\ U - BTU\ Per\ Foot\ I) \times Existing/EFFb$$

$$BTU\ Per\ Foot = Coef0 + (Coef1 \times DeltaT) + (Coef2 \times DeltaT^2) + (Coef3 \times DeltaT^3)$$

$$DeltaT = Tfluid - Tambient$$

Variables

Hrs	See Table 12.1.7	= The operating hours for the boiler system.
T ambient	70	= Average temperature of the space surrounding the pipe for conditioned spaces.
	46	= Average temperature of the space surrounding the pipe for outside domestic hot water, full year average based on average TMY3 temperatures for Minnesota. (Ref 10)
	35	= Average temperature of the space surrounding the pipe for outside space heating (average excluding June-September) based on average TMY3 temperatures for Minnesota. (Ref 10)
Existing		= Pipe insulation savings multiplier to determine credit if existing deteriorated insulation is being replaced.
	1	= Multiplier of 1 if no existing insulation is present.
	0.25	= Pipe insulation savings multiplier of 0.25 if existing insulation is being replaced.
Effb	See Table 12.2.0	= Efficiency of boiler or water heater serving the pipes being insulated.
Measure Life	See Table 12.1.0	Refer to table 15 for measure life.

Customer Inputs	**M&V Verified**	
LFT	Yes	Linear feet of insulation installed, provided by the customer.
T fluid	Yes	Average temperature of the fluid in the pipe receiving insulation in degrees F

Table 12.1.7 Hours for Pipe Insulation (Ref 28)

Use of Pipe	Location	Pipe Insulation	Explanation
Domestic Hot Water	Inside	4,828	Hours when outside temp is above building balance point. Heat loss from pipe is wasted.
Domestic Hot Water	Outside	8,760	Domestic hot water available year round, outside temp is always less than 120 F.
Space Heating	Inside	1,888	Hours when boiler is running but outdoor temp is above building balance point
Space Heating	Outside	5,037	Hours that boiler is running

Table 12.2.7 Deemed Insulation Polynomial Equation Coefficients and Incremental Costs

Pipe Nominal Diameter (inches)	Insulation Thickness (Inches)	Heat Loss (BTU/Hr) at Specified Temperature Difference					Polynomial Coefficients				Cost Per Foot	Cost Per 3' Materials
		5	70	135	200	265	Coef0	Coef1	Coef2	Coef3	Total	(Ref 28)
0.50	-	1.73000	35.90	81.40	136.0	201.0	-0.51699	0.432767	0.001310573	-2.82203E-07	$ -	$ -
0.50	0.5	0.64500	10.10	21.20	34.4	50.0	-0.02055	0.132796	0.000150494	2.291E-07	$ 6.18	$ 6.18
0.50	1	0.46300	7.07	14.80	23.9	34.6	-0.00507	0.093144	0.000102935	1.44743E-07	$ 7.47	$ 7.47
0.50	1.5	0.37900	5.75	12.00	19.4	28.0	0.003985	0.075186	8.91729E-05	9.74056E-08	$ 14.18	$ 14.18
0.50	2	0.33700	5.10	10.60	17.1	24.7	0.000608	0.0674	6.8221E-05	1.1015E-07	$ 22.02	$ 22.02
0.50	2.5	0.29500	4.45	9.28	14.9	21.6	-0.00748	0.059744	4.96359E-05	1.22895E-07	$ 26.02	$ 26.02
0.50	3	0.27800	4.18	8.72	14.0	20.3	-0.00631	0.056116	4.66467E-05	1.15916E-07	$ 31.44	$ 31.44
0.50	3.5	0.26400	3.97	8.28	13.3	19.2	-0.00185	0.052724	5.22687E-05	8.37506E-08	$ 36.87	$ 36.87
0.50	4	0.25300	3.80	7.92	12.7	18.4	-0.00605	0.051106	4.13115E-05	1.05295E-07	$ 42.29	$ 42.29
0.50	4.5	0.24200	3.64	7.59	12.2	17.6	-0.00056	0.0482	4.96014E-05	7.22E-08	$ 47.71	$ 47.71
0.50	5	0.23500	3.53	7.34	11.8	17.1	-0.00337	0.047319	3.88419E-05	9.86193E-08	$ 53.14	$ 53.14
0.50	5.5	0.23400	3.51	7.31	11.8	17.0	0.005221	0.045902	5.38618E-05	5.64406E-08	$ 58.56	$ 58.56
0.50	6	0.22700	3.41	7.10	11.4	16.5	-0.00354	0.045662	3.91228E-05	8.89091E-08	$ 63.98	$ 63.98
0.75	-	2.09000	43.40	98.50	165.0	245.0	-0.64102	0.525694	0.001536569	-8.79988E-08	$ -	$ -
0.75	0.5	0.75300	11.80	24.90	40.4	58.7	-0.02396	0.154265	0.000194013	2.26673E-07	$ 7.00	$ 7.00
0.75	1	0.55600	8.51	17.80	28.8	41.8	-0.00762	0.11237	0.000117924	2.01487E-07	$ 8.17	$ 8.17
0.75	1.5	0.43900	6.66	13.90	22.4	32.5	-0.0085	0.088807	8.10579E-05	1.76301E-07	$ 14.24	$ 14.24
0.75	2	0.38300	5.80	12.10	19.5	28.2	-0.00261	0.076776	7.83555E-05	1.26536E-07	$ 22.77	$ 22.77
0.75	2.5	0.32900	4.97	10.40	16.7	24.1	-0.00405	0.065833	6.97763E-05	9.43711E-08	$ 26.39	$ 26.39
0.75	3	0.30800	4.64	9.66	15.5	22.5	-0.00946	0.062664	4.6068E-05	1.43226E-07	$ 31.73	$ 31.73
0.75	3.5	0.29100	4.38	9.12	14.7	21.2	0.002693	0.057658	6.2664E-05	8.16265E-08	$ 37.07	$ 37.07
0.75	4	0.27700	4.17	8.69	14.0	20.2	0.001543	0.054974	5.90396E-05	7.98058E-08	$ 42.40	$ 42.40
0.75	4.5	0.26600	3.99	8.32	13.4	19.3	0.003691	0.052372	5.99558E-05	6.4937E-08	$ 47.74	$ 47.74
0.75	5	0.25600	3.85	8.02	12.9	18.6	0.000586	0.050883	5.32258E-05	7.40404E-08	$ 53.08	$ 53.08
0.75	5.5	0.25300	3.80	7.92	12.7	18.4	-0.00605	0.051106	4.13115E-05	1.05295E-07	$ 58.42	$ 58.42
0.75	6	0.24500	3.68	7.67	12.3	17.8	-0.00491	0.049356	4.19306E-05	9.55849E-08	$ 63.76	$ 63.76
1.00	-	2.52000	52.60	120.00	201.0	297.0	-0.72837	0.624724	0.002067703	-7.0399E-07	$ -	$ -
1.00	0.5	0.88700	13.90	29.40	47.8	69.5	-0.02227	0.180671	0.000242842	2.467E-07	$ 7.22	$ 7.22
1.00	1	0.57800	8.83	18.50	29.8	43.2	-0.01521	0.11731	0.000117809	2.06949E-07	$ 8.77	$ 8.77
1.00	1.5	0.47600	7.22	15.10	24.3	35.2	-0.00942	0.096052	9.35275E-05	1.71142E-07	$ 15.25	$ 15.25
1.00	2	0.41300	6.24	13.00	21.0	30.3	0.00523	0.08179	9.32915E-05	1.11364E-07	$ 24.21	$ 24.21
1.00	2.5	0.37300	5.63	11.70	18.9	27.3	0.003819	0.07415	7.78159E-05	1.17433E-07	$ 28.23	$ 28.23
1.00	3	0.34500	5.21	10.90	17.5	25.2	-0.00201	0.068713	7.74465E-05	8.34471E-08	$ 33.97	$ 33.97
1.00	3.5	0.32400	4.88	10.20	16.4	23.6	0.001685	0.064073	7.52741E-05	7.16128E-08	$ 39.72	$ 39.72
1.00	4	0.30700	4.63	9.64	15.5	22.4	-0.00292	0.061613	5.81228E-05	1.07116E-07	$ 45.46	$ 45.46
1.00	4.5	0.29200	4.40	9.16	14.7	21.3	-0.0072	0.059166	4.73061E-05	1.23805E-07	$ 51.21	$ 51.21
1.00	5	0.26800	4.02	8.37	13.5	19.4	0.00719	0.052386	6.46778E-05	5.21924E-08	$ 56.95	$ 56.95
1.00	5.5	0.27500	4.13	8.61	13.8	20.0	-0.00733	0.055629	4.39788E-05	1.16826E-07	$ 62.70	$ 62.70
1.00	6	0.26600	4.00	8.33	13.4	19.3	0.001648	0.052738	5.69907E-05	7.10059E-08	$ 68.44	$ 68.44
1.00	6.5	0.25800	3.88	8.08	13.0	18.8	-0.00152	0.051607	4.87015E-05	9.16401E-08	$ 74.19	$ 74.19
1.00	7	0.25100	3.78	7.87	12.7	18.3	0.004048	0.04953	5.68509E-05	6.34198E-08	$ 79.93	$ 79.93
1.00	7.5	0.24500	3.69	7.67	12.3	17.8	-0.00565	0.049631	3.93036E-05	1.01654E-07	$ 85.68	$ 85.68
1.00	8	0.24000	3.60	7.50	12.1	17.4	0.006196	0.046928	5.77671E-05	4.85511E-08	$ 91.42	$ 91.42
1.00	8.5	0.23500	3.53	7.35	11.8	17.1	-0.00467	0.047411	3.85038E-05	9.86193E-08	$ 97.17	$ 97.17
1.00	9	0.23000	3.46	7.20	11.6	16.7	0.003091	0.04544	5.10371E-05	5.76544E-08	$ 102.91	$ 102.91
1.00	9.5	0.22600	3.40	7.07	11.4	16.4	0.004309	0.044519	5.15157E-05	5.27993E-08	$ 108.66	$ 108.66
1.00	10	0.22200	3.34	6.95	11.2	16.1	0.004222	0.04369	5.16562E-05	4.79442E-08	$ 114.40	$ 114.40
1.25	-	3.11000	64.80	147.00	248.0	368.0	-0.81894	0.767967	0.002475005	-4.58201E-07	$ -	$ -
1.25	0.5	1.01000	15.80	33.40	54.2	78.8	-0.03151	0.206375	0.000264133	3.0041E-07	$ 7.71	$ 7.71
1.25	1	0.73700	11.30	23.70	38.4	55.6	-0.00142	0.147521	0.000181817	2.01183E-07	$ 9.48	$ 9.48
1.25	1.5	0.53100	8.05	16.80	27.1	39.2	-0.00258	0.106352	0.000111172	1.7266E-07	$ 16.60	$ 16.60
1.25	2	0.48900	7.41	15.50	24.9	36.0	-0.00971	0.098536	9.81917E-05	1.61129E-07	$ 25.56	$ 25.56
1.25	2.5	0.43300	6.55	13.70	22.0	31.8	-0.00812	0.087123	8.65811E-05	1.41708E-07	$ 30.01	$ 30.01
1.25	3	0.39700	5.98	12.50	20.1	29.0	-0.00106	0.078961	8.58034E-05	1.1015E-07	$ 36.07	$ 36.07
1.25	3.5	0.36900	5.56	11.60	18.7	26.9	0.006159	0.072611	8.88153E-05	7.61645E-08	$ 42.14	$ 42.14
1.25	4	0.34700	5.23	10.90	17.5	25.3	-0.00558	0.069832	6.35978E-05	1.25322E-07	$ 48.21	$ 48.21
1.25	4.5	0.32800	4.94	10.30	16.5	23.9	-0.00995	0.066556	5.29215E-05	1.37157E-07	$ 54.27	$ 54.27
1.25	5	0.31400	4.72	9.83	15.8	22.8	-0.00084	0.062614	6.21848E-05	9.89228E-08	$ 60.34	$ 60.34
1.25	5.5	0.30300	4.55	9.47	15.2	22.0	-0.00503	0.060996	5.12276E-05	1.20467E-07	$ 66.41	$ 66.41
1.25	6	0.29200	4.39	9.14	14.7	21.2	0.000448	0.058091	5.95175E-05	8.73919E-08	$ 72.47	$ 72.47
1.50	-	3.50000	73.10	167.00	280.0	416.0	-1.08947	0.878264	0.002727811	-3.94477E-07	$ -	$ -
1.50	0.5	1.18000	18.70	39.40	64.1	93.2	-0.04143	0.243931	0.00030924	3.70202E-07	$ 8.88	$ 8.88
1.50	1	0.74800	11.50	24.00	38.8	56.2	-0.01167	0.151853	0.000158962	2.58534E-07	$ 10.23	$ 10.23
1.50	1.5	0.59900	9.11	19.00	30.7	44.4	-0.00057	0.11995	0.000129735	1.88439E-07	$ 17.36	$ 17.36
1.50	2	0.47800	7.23	15.10	24.3	35.1	-0.00365	0.09566	0.000100122	1.4626E-07	$ 26.68	$ 26.68
1.50	2.5	0.43400	6.54	13.60	22.0	31.7	0.011069	0.085292	0.000101654	1.04992E-07	$ 30.92	$ 30.92
1.50	3	0.40100	6.04	12.60	20.3	29.3	0.001635	0.079607	8.63392E-05	1.15005E-07	$ 36.97	$ 36.97
1.50	3.5	0.37500	5.65	11.80	19.0	27.4	0.00153	0.074346	8.34742E-05	9.86193E-08	$ 43.03	$ 43.03
1.50	4	0.35300	5.31	11.10	17.8	25.7	-0.00517	0.070674	6.97919E-05	1.11364E-07	$ 49.08	$ 49.08
1.50	4.5	0.33700	5.06	10.50	17.0	24.5	0.010881	0.065988	7.70382E-05	8.58747E-08	$ 55.13	$ 55.13
1.50	5	0.32300	4.85	10.10	16.3	23.5	0.005817	0.063578	7.23994E-05	8.4054E-08	$ 61.19	$ 61.19
1.50	5.5	0.32100	4.82	10.00	16.1	23.3	-0.00119	0.064326	5.53879E-05	1.27143E-07	$ 67.24	$ 67.24
1.50	6	0.30900	4.64	9.68	15.6	22.5	0.003362	0.060986	6.84368E-05	8.22333E-08	$ 73.29	$ 73.29
2.00	-	4.30000	90.00	205.00	346.0	514.0	-1.16894	1.063995	0.003504974	-6.97921E-07	$ -	$ -
2.00	0.5	1.43000	22.70	48.00	78.1	114.0	-0.0712	0.297778	0.0003583	5.37096E-07	$ 9.48	$ 9.48
2.00	1	0.87700	13.40	28.20	45.5	66.0	-0.0189	0.176817	0.000198555	2.80079E-07	$ 11.07	$ 11.07
2.00	1.5	0.68300	10.40	21.70	35.0	50.6	-0.00582	0.13737	0.000144615	2.17569E-07	$ 19.13	$ 19.13
2.00	2	0.58000	8.79	18.30	29.6	42.7	0.008894	0.114918	0.000134157	1.51722E-07	$ 28.12	$ 28.12
2.00	2.5	0.51600	7.80	16.30	26.2	37.8	-0.0042	0.103155	0.000110122	1.46867E-07	$ 32.95	$ 32.95
2.00	3	0.47000	7.09	14.80	23.8	34.4	-0.00455	0.094123	9.37057E-05	1.54756E-07	$ 39.34	$ 39.34
2.00	3.5	0.43600	6.56	13.70	22.0	31.8	-0.00555	0.087324	8.44242E-05	1.46867E-07	$ 45.74	$ 45.74
2.00	4	0.40500	6.10	12.70	20.4	29.5	-0.0057	0.081471	7.28949E-05	1.50205E-07	$ 52.14	$ 52.14
2.00	4.5	0.38400	5.78	12.00	19.4	28.0	0.007291	0.075889	8.20756E-05	1.14095E-07	$ 58.54	$ 58.54
2.00	5	0.36600	5.51	11.50	18.5	26.7	-0.00047	0.072833	7.6901E-05	1.07419E-07	$ 64.94	$ 64.94
2.00	5.5	0.35600	5.35	11.10	17.9	25.9	0.00092	0.0711	6.48261E-05	1.34729E-07	$ 71.33	$ 71.33
2.00	6	0.34900	5.25	10.90	17.6	25.4	0.005184	0.069115	7.26374E-05	1.06509E-07	$ 77.73	$ 77.73
2.50	-	5.12000	107.00	244.00	412.0	612.0	-1.36423	1.261116	0.00422519	-9.46746E-07	$ -	$ -
2.50	0.5	1.65000	26.20	55.40	90.0	131.0	-0.07811	0.342733	0.00043244	5.31027E-07	$ 9.94	$ 9.94
2.50	1	1.01000	15.50	32.40	52.4	75.9	-0.01211	0.204127	0.000223103	3.30754E-07	$ 12.60	$ 12.60
2.50	1.5	0.70300	10.70	22.30	35.9	51.9	-0.01112	0.142115	0.000138841	2.41845E-07	$ 20.55	$ 20.55
2.50	2	0.61000	9.24	19.30	31.0	44.9	-0.01569	0.123575	0.000111288	2.33652E-07	$ 30.28	$ 30.28
2.50	2.5	0.54700	8.26	17.20	27.8	40.1	0.008995	0.108095	0.000125032	1.43529E-07	$ 35.59	$ 35.59
2.50	3	0.50100	7.56	15.80	25.4	36.6	-0.00084	0.099633	0.000111516	1.27143E-07	$ 42.48	$ 42.48
2.50	3.5	0.46200	6.96	14.50	23.3	33.7	-0.00618	0.09286	8.46622E-05	1.69322E-07	$ 49.38	$ 49.38
2.50	4	0.43400	6.54	13.60	21.9	31.6	0.001039	0.086511	8.76741E-05	1.35336E-07	$ 56.28	$ 56.28
2.50	4.5	0.41200	6.20	12.90	20.8	30.0	0.004369	0.081621	8.79719E-05	1.17736E-07	$ 63.17	$ 63.17

2.50	5	0.38900	5.85	12.20	19.6	28.3	-0.0027	0.077698	7.67599E-05	1.24716E-07	$ 70.07	$ 70.07
2.50	5.5	0.39000	5.86	12.20	19.6	28.4	-0.00663	0.078567	6.53814E-05	1.60825E-07	$ 76.97	$ 76.97
2.50	6	0.36100	5.42	11.30	18.2	26.2	0.005262	0.071074	8.23987E-05	8.46609E-08	$ 83.86	$ 83.86
3.00	-	6.12000	128.00	292.00	493.0	734.0	-1.71306	1.518859	0.004913792	-6.43301E-07	$ -	$ -
3.00	0.5	1.97000	31.30	66.30	108.0	157.0	-0.06235	0.404796	0.000578041	4.94614E-07	$ 11.11	$ 11.11
3.00	1	1.18000	18.20	38.10	61.5	89.2	-0.03546	0.241338	0.000245777	4.30891E-07	$ 13.47	$ 13.47
3.00	1.5	0.90300	13.80	28.80	46.4	67.2	-0.02065	0.183546	0.000176359	3.32878E-07	$ 21.50	$ 21.50
3.00	2	0.75600	11.50	23.90	38.6	55.8	-0.00125	0.151944	0.000153453	2.56107E-07	$ 32.08	$ 32.08
3.00	2.5	0.66100	10.00	20.90	33.6	48.6	-0.0108	0.132954	0.000131023	2.24245E-07	$ 37.28	$ 37.28
3.00	3	0.59500	8.98	18.70	30.1	43.6	-0.00782	0.119808	0.000107338	2.32135E-07	$ 44.37	$ 44.37
3.00	3.5	0.53900	8.13	16.90	27.3	39.4	0.007359	0.106833	0.000115989	1.58094E-07	$ 51.46	$ 51.46
3.00	4	0.50200	7.56	15.80	25.4	36.6	0.000266	0.099608	0.000111673	1.2684E-07	$ 58.56	$ 58.56
3.00	4.5	0.47300	7.12	14.80	23.9	34.5	0.006581	0.093656	0.000100275	1.41708E-07	$ 65.65	$ 65.65
3.00	5	0.44200	6.65	13.90	22.3	32.2	-0.00588	0.088441	8.79914E-05	1.38977E-07	$ 72.75	$ 72.75
3.00	5.5	0.42300	6.36	13.30	21.3	30.8	-0.01025	0.085165	7.73152E-05	1.50812E-07	$ 79.84	$ 79.84
3.00	6	0.40600	6.10	12.70	20.4	29.5	-0.00459	0.081447	7.30516E-05	1.49901E-07	$ 86.93	$ 86.93
3.50	-	6.92000	145.00	331.00	559.0	832.0	-1.93043	1.716468	0.005630873	-8.86057E-07	$ -	$ -
3.50	0.5	2.18000	34.60	73.30	119.0	174.0	-0.1423	0.45737	0.000510683	9.16401E-07	$ 13.37	$ 13.37
3.50	1.0	1.11000	17.00	35.70	57.6	83.4	-0.02043	0.223916	0.000255225	3.30754E-07	$ 14.60	$ 14.60
3.50	1.5	0.89900	13.70	28.50	46.0	66.6	-0.01005	0.181792	0.000174042	3.34092E-07	$ 23.58	$ 23.58
3.50	2.0	0.76700	11.60	24.30	39.1	56.5	-0.00714	0.153222	0.000167467	2.22425E-07	$ 34.83	$ 34.83
3.50	2.5	0.67900	10.30	21.40	34.5	49.9	-0.00525	0.136835	0.000128317	2.49128E-07	$ 39.94	$ 39.94
3.50	3.0	0.60900	9.19	19.20	30.9	44.6	-0.00148	0.121294	0.000131484	1.73267E-07	$ 47.27	$ 47.27
3.50	3.5	0.56200	8.47	17.70	28.4	41.0	-0.00792	0.112611	0.000112466	1.75391E-07	$ 54.61	$ 54.61
3.50	4.0	0.52400	7.90	16.50	26.5	38.3	-0.00736	0.105116	0.000102467	1.74784E-07	$ 61.94	$ 61.94
3.50	4.5	0.52600	7.92	16.50	26.6	38.4	0.003398	0.104399	0.000111507	1.5597E-07	$ 69.28	$ 69.28
3.50	5.0	0.48800	7.34	15.30	24.6	35.6	-0.00534	0.097847	9.01541E-05	1.79639E-07	$ 76.62	$ 76.62
3.50	5.5	0.46500	6.99	14.60	23.4	33.9	-0.01241	0.093925	7.89421E-05	1.86618E-07	$ 83.95	$ 83.95
3.50	6.0	0.44400	6.68	13.90	22.4	32.3	0.004144	0.087999	9.44041E-05	1.26233E-07	$ 91.29	$ 91.29
4.00	-	7.72000	162.00	369.00	624.0	929.0	-2.11759	1.917129	0.006241966	-8.25368E-07	$ -	$ -
4.00	0.5	2.32000	36.70	77.80	126.0	184.0	-0.15691	0.48603	0.000540165	9.34608E-07	$ 14.12	$ 14.12
4.00	1.0	1.42000	21.90	45.80	74.1	107.0	-0.00829	0.286132	0.000349321	3.58064E-07	$ 17.83	$ 17.83
4.00	1.5	1.09000	16.60	34.70	55.9	80.9	-0.01859	0.220043	0.000224585	3.67167E-07	$ 24.48	$ 24.48
4.00	2.0	0.90100	13.70	28.50	46.0	66.6	-0.00785	0.181743	0.000174355	3.33485E-07	$ 37.48	$ 37.48
4.00	2.5	0.78100	11.80	24.70	39.7	57.5	-0.01566	0.157192	0.000151844	2.78865E-07	$ 42.66	$ 42.66
4.00	3.0	0.68800	10.40	21.70	34.9	50.4	-0.00603	0.137848	0.000140326	2.16052E-07	$ 50.33	$ 50.33
4.00	3.5	0.62800	9.48	19.80	31.8	46.0	-0.01144	0.126406	0.000119272	2.22121E-07	$ 58.01	$ 58.01
4.00	4.0	0.58200	8.77	18.30	29.4	42.5	-0.00748	0.116756	0.000111764	1.99666E-07	$ 65.68	$ 65.68
4.00	4.5	0.53700	8.09	16.90	27.1	39.2	-0.01196	0.108218	9.82229E-05	1.95115E-07	$ 73.35	$ 73.35
4.00	5.0	0.50800	7.64	15.90	25.6	37.0	-0.0006	0.101373	9.83601E-05	1.7357E-07	$ 81.03	$ 81.03
4.00	5.5	0.48400	7.29	15.20	24.4	35.3	-0.00877	0.097475	8.69914E-05	1.80853E-07	$ 88.70	$ 88.70
4.00	6.0	0.46300	6.96	14.50	23.3	33.7	-0.00508	0.092836	8.48189E-05	1.69018E-07	$ 96.37	$ 96.37
4.50	-	8.52000	178.00	408.00	689.0	1027.0	-2.40445	2.105609	0.00699286	-1.06812E-06	$ -	$ -
4.50	0.5	2.55000	40.30	85.30	139.0	202.0	-0.05859	0.520385	0.000748911	6.2206E-07	$ 15.84	$ 15.84
4.50	1.0	1.33000	20.30	42.50	64.7	99.3	-0.57481	0.339228	-0.000598459	2.78258E-06	$ 18.42	$ 18.42
4.50	1.5	1.06000	16.10	33.60	54.3	78.5	0.002668	0.211536	0.00023601	3.15582E-07	$ 25.56	$ 25.56
4.50	2.0	0.89700	13.60	28.40	45.8	66.2	-0.00329	0.17938	0.000193236	2.7401E-07	$ 40.36	$ 40.36
4.50	2.5	0.77800	11.80	24.60	39.5	57.1	-0.01739	0.157553	0.000144611	2.79775E-07	$ 45.22	$ 45.22
4.50	3.0	0.70300	10.60	22.10	35.6	51.5	-0.00342	0.140576	0.000138841	2.41845E-07	$ 53.29	$ 53.29
4.50	3.5	0.64500	9.73	20.30	32.6	47.2	-0.01334	0.130155	0.000115563	2.47307E-07	$ 61.36	$ 61.36
4.50	4.0	0.59000	8.89	18.50	29.8	43.1	-0.00209	0.118048	0.000112836	2.09376E-07	$ 69.43	$ 69.43
4.50	4.5	0.59100	8.90	18.60	29.9	43.1	-0.00044	0.117376	0.000129873	1.54453E-07	$ 77.50	$ 77.50
4.50	5.0	0.55500	8.36	17.40	28.0	40.5	-0.0042	0.111274	0.000103397	2.0179E-07	$ 85.57	$ 85.57
4.50	5.5	0.52800	7.95	16.60	26.6	38.5	-0.01396	0.106706	9.16497E-05	2.03914E-07	$ 93.64	$ 93.64
4.50	6.0	0.50300	7.56	15.80	25.3	36.6	-0.01296	0.10142	8.89414E-05	1.87225E-07	$ 101.71	$ 101.71
5.00	-	9.49000	199.00	454.00	768.0	1145.0	-2.63999	2.35783	0.007642948	-7.55576E-07	$ -	$ -
5.00	0.5	2.90000	46.00	97.40	158.0	231.0	-0.19629	0.609342	0.000662657	1.24412E-06	$ 17.71	$ 17.71
5.00	1	1.76000	27.20	57.00	92.2	134.0	-0.05303	0.360287	0.000369179	6.79715E-07	$ 20.14	$ 20.14
5.00	1.5	1.32000	20.10	42.10	68.0	98.5	-0.0116	0.26479	0.00029262	4.18753E-07	$ 27.40	$ 27.40
5.00	2	1.08000	16.40	34.20	55.1	79.7	-0.01266	0.217498	0.000216256	3.70202E-07	$ 42.88	$ 42.88
5.00	2.5	0.90700	13.70	28.70	46.2	66.8	-0.00726	0.180986	0.000196493	2.70976E-07	$ 47.73	$ 47.73
5.00	3	0.80600	12.20	25.40	40.9	59.2	-0.01008	0.16244	0.000150235	3.01623E-07	$ 56.00	$ 56.00
5.00	3.5	0.73100	11.00	23.00	37.1	53.5	0.00946	0.143922	0.000172879	1.7266E-07	$ 64.28	$ 64.28
5.00	4	0.66100	9.97	20.80	33.5	48.3	0.003032	0.131199	0.000146122	1.75694E-07	$ 72.56	$ 72.56
5.00	4.5	0.61700	9.29	19.40	31.2	45.0	-0.00034	0.122637	0.000132737	1.70839E-07	$ 80.83	$ 80.83
5.00	5	0.58100	8.74	18.20	29.3	42.3	0.000948	0.115643	0.000117798	1.81763E-07	$ 89.11	$ 89.11
5.00	5.5	0.55200	8.31	17.30	27.9	40.2	0.007803	0.109042	0.00012328	1.42012E-07	$ 97.39	$ 97.39
5.00	6	0.52700	7.92	16.50	26.6	38.4	0.004502	0.104374	0.000111663	1.55667E-07	$ 105.66	$ 105.66
6.00	-	11.20000	234.00	535.00	905.0	1350.0	-3.0891	2.769051	0.009072892	-9.71021E-07	$ -	$ -
6.00	0.5	3.53000	56.30	119.00	194.0	283.0	-0.15708	0.734636	0.000932785	1.23502E-06	$ 19.84	$ 19.84
6.00	1	2.09000	32.20	67.70	109.0	159.0	-0.12171	0.433384	0.000363801	1.0044E-06	$ 21.37	$ 21.37
6.00	1.5	1.54000	23.50	49.20	79.4	115.0	-0.02213	0.310347	0.000333273	5.03717E-07	$ 28.93	$ 28.93
6.00	2	1.22000	18.50	38.70	62.3	90.2	-0.02011	0.245576	0.000246973	4.18753E-07	$ 44.19	$ 44.19
6.00	2.5	1.04000	15.80	32.90	53.1	76.7	-0.00048	0.208297	0.000221042	3.21651E-07	$ 48.74	$ 48.74
6.00	3	0.92000	13.90	29.00	46.7	67.5	-0.00527	0.184051	0.000187932	2.97375E-07	$ 56.80	$ 56.80
6.00	3.5	0.81000	12.20	25.50	41.0	59.3	-0.00869	0.162037	0.00016146	2.70065E-07	$ 64.86	$ 64.86
6.00	4	0.74500	11.20	23.40	37.7	54.4	0.005232	0.147275	0.000166165	1.98756E-07	$ 72.92	$ 72.92
6.00	4.5	0.69200	10.40	21.70	35.0	50.5	0.008415	0.136532	0.000154933	1.84494E-07	$ 80.98	$ 80.98
6.00	5	0.64500	9.70	20.20	32.5	47.0	-0.0038	0.129017	0.000121754	2.291E-07	$ 89.04	$ 89.04
6.00	5.5	0.61600	9.27	19.30	31.1	44.9	0.003055	0.122417	0.000127236	1.89349E-07	$ 97.10	$ 97.10
6.00	6	0.58600	8.82	18.40	29.6	42.7	0.000252	0.116509	0.000123835	1.68108E-07	$ 105.16	$ 105.16
7.00	-	12.70000	267.00	611.00	1034.0	1542.0	-3.55732	3.151329	0.010491384	-1.42619E-06	$ -	$ -
7.00	0.5	4.01000	64.00	136.00	221.0	322.0	-0.22197	0.83504	0.001116074	1.21074E-06	$ 39.14	$ 39.14
7.00	1	2.43000	37.60	79.00	128.0	185.0	-0.01492	0.488496	0.000649086	5.37096E-07	$ 43.13	$ 43.13
7.00	1.5	1.68000	25.60	53.60	86.5	125.0	-0.00936	0.336258	0.000389024	4.61235E-07	$ 47.13	$ 47.13
7.00	2	1.36000	20.70	43.20	69.6	101.0	-0.0335	0.27642	0.000247584	5.58337E-07	$ 51.12	$ 51.12
7.00	2.5	1.16000	17.60	36.60	59.1	85.4	0.001981	0.232222	0.000240172	3.76271E-07	$ 55.11	$ 55.11
7.00	3	0.98900	15.00	31.20	50.2	72.6	-0.01515	0.199941	0.000182163	3.67471E-07	$ 59.11	$ 59.11
7.00	3.5	0.89400	13.50	28.10	45.3	65.5	-0.00162	0.17882	0.000177095	3.05265E-07	$ 63.10	$ 63.10
7.00	4	0.82000	12.40	25.80	41.5	59.9	-0.00571	0.164557	0.000161337	2.67031E-07	$ 67.10	$ 67.10
7.00	4.5	0.76000	11.40	23.90	38.4	55.5	-0.00521	0.150916	0.000161298	2.24549E-07	$ 71.09	$ 71.09
7.00	5	0.71100	10.70	22.30	35.9	51.9	-0.00228	0.141919	0.000140094	2.39417E-07	$ 75.08	$ 75.08
7.00	5.5	0.67400	10.20	21.20	34.0	49.2	-0.01884	0.137237	0.000108482	2.80989E-07	$ 79.08	$ 79.08
7.00	6	0.63900	9.62	20.00	32.3	46.6	0.010121	0.126339	0.000138448	1.8237E-07	$ 83.07	$ 83.07
8.00	-	14.30000	300.00	687.00	1163.0	1734.0	-3.91514	3.531163	0.011925548	-1.9117E-06	$ -	$ -
8.00	0.5	4.56000	72.80	155.00	252.0	367.0	-0.23656	0.945864	0.001334781	1.22591E-06	$ 44.73	$ 44.73
8.00	1	2.60000	40.20	84.50	137.0	198.0	-0.00621	0.521115	0.000708629	5.46199E-07	$ 49.29	$ 49.29
8.00	1.5	1.86000	28.40	59.40	95.9	139.0	-0.02921	0.375704	0.000389921	6.4937E-07	$ 53.86	$ 53.86
8.00	2	1.50000	22.80	47.70	76.9	111.0	-0.00512	0.299572	0.000345731	3.94477E-07	$ 58.42	$ 58.42
8.00	2.5	1.23000	18.60	38.90	62.6	90.5	-0.01246	0.246252	0.000257448	3.85374E-07	$ 62.99	$ 62.99
8.00	3	1.08000	16.40	34.20	55.1	79.6	-0.00836	0.21688	0.000225164	3.39857E-07	$ 67.55	$ 67.55

8.00	3.5	0.97700	14.80	30.80	49.5	71.6	-0.01874	0.197758	0.000175211	3.71112E-07	$ 72.12	$ 72.12
8.00	4	0.89400	13.50	28.10	45.3	65.4	0.002678	0.178202	0.000186003	2.7492E-07	$ 76.68	$ 76.68
8.00	4.5	0.82700	12.50	26.00	41.8	60.4	-0.00997	0.166542	0.000153526	2.95251E-07	$ 81.24	$ 81.24
8.00	5	0.77200	11.60	24.20	39.0	56.3	0.005703	0.152787	0.00016656	2.20907E-07	$ 85.81	$ 85.81
8.00	5.5	0.73100	11.00	22.90	36.9	53.3	0.00245	0.145445	0.0001483	2.33349E-07	$ 90.37	$ 90.37
8.00	6	0.69300	10.40	21.70	35.0	50.5	0.009519	0.136508	0.00015509	1.84191E-07	$ 94.94	$ 94.94
9.00	-	15.90000	333.00	762.00	1291.0	1926.0	-4.28575	3.920228	0.01316464	-1.79032E-06	$ -	$ -
9.00	0.5	4.69000	74.60	158.00	257.0	375.0	-0.2449	0.97719	0.001212621	1.67198E-06	$ 50.32	$ 50.32
9.00	1	2.85000	44.00	92.40	150.0	217.0	0.004233	0.57031	0.000765362	6.52405E-07	$ 55.46	$ 55.46
9.00	1.5	2.04000	31.20	65.20	105.0	152.0	-0.04905	0.414479	0.000411236	7.16128E-07	$ 60.59	$ 60.59
9.00	2	1.57000	23.80	49.70	80.2	116.0	-0.00477	0.313917	0.000336283	4.94614E-07	$ 65.73	$ 65.73
9.00	2.5	1.34000	20.30	42.40	68.3	98.7	-0.00905	0.268265	0.00028392	4.12684E-07	$ 70.86	$ 70.86
9.00	3	1.18000	17.80	37.20	59.9	86.6	-0.00596	0.235436	0.000246687	3.70202E-07	$ 76.00	$ 76.00
9.00	3.5	1.06000	16.00	33.40	53.8	77.7	-0.0011	0.211198	0.000225866	3.15582E-07	$ 81.13	$ 81.13
9.00	4	0.96800	14.60	30.50	49.0	70.8	-0.01202	0.193978	0.000193308	3.13154E-07	$ 86.27	$ 86.27
9.00	4.5	0.89300	13.50	28.10	45.2	65.2	-0.00416	0.178826	0.000180774	2.75224E-07	$ 91.40	$ 91.40
9.00	5	0.83300	12.50	26.20	42.1	60.8	-0.00366	0.165185	0.000180735	2.32742E-07	$ 96.53	$ 96.53
9.00	5.5	0.78800	11.90	24.70	39.8	57.4	0.003312	0.157316	0.000158468	2.46397E-07	$ 101.67	$ 101.67
9.00	6	0.75100	11.30	23.60	37.9	54.7	-0.00587	0.149885	0.000153125	2.2728E-07	$ 106.80	$ 106.80
10.00	-	17.70000	370.00	847.00	1435.0	2142.0	-4.77502	4.360196	0.014570323	-1.72963E-06	$ -	$ -
10.00	0.5	5.68000	91.00	193.00	315.0	459.0	-0.23064	1.177517	0.001668431	1.61432E-06	$ 55.91	$ 55.91
10.00	1	3.35000	51.90	109.00	177.0	257.0	-0.04412	0.678251	0.000823688	1.04688E-06	$ 61.62	$ 61.62
10.00	1.5	2.18000	33.30	69.60	112.0	163.0	-0.0936	0.448405	0.000355017	1.03778E-06	$ 67.32	$ 67.32
10.00	2	1.76000	26.80	56.00	90.2	131.0	-0.05061	0.358344	0.00031755	7.40404E-07	$ 73.03	$ 73.03
10.00	2.5	1.49000	22.60	47.30	76.2	110.0	-0.00651	0.297339	0.000339092	3.97512E-07	$ 78.73	$ 78.73
10.00	3	1.31000	19.80	41.30	66.5	96.1	-0.00785	0.262194	0.000267384	4.21787E-07	$ 84.44	$ 84.44
10.00	3.5	1.17000	17.70	36.90	59.4	85.8	-0.00772	0.234429	0.000238358	3.73236E-07	$ 90.14	$ 90.14
10.00	4	1.06000	16.10	33.50	53.9	77.9	-0.0158	0.214259	0.000201287	3.76271E-07	$ 95.85	$ 95.85
10.00	4.5	0.97800	14.70	30.70	49.5	71.5	0.007093	0.193453	0.000213927	2.79775E-07	$ 101.56	$ 101.56
10.00	5	0.91000	13.70	28.60	46.0	66.4	-0.00236	0.1812	0.000190201	2.70065E-07	$ 107.26	$ 107.26
10.00	5.5	0.85900	12.90	27.00	43.4	62.7	-0.00429	0.170721	0.000180973	2.55196E-07	$ 112.97	$ 112.97
10.00	6	0.81000	12.20	25.40	40.9	59.0	0.002934	0.161107	0.000168678	2.39721E-07	$ 118.67	$ 118.67
12.00	-	20.80000	435.00	997.00	1691.0	2524.0	-5.46683	5.100921	0.017473698	-2.67031E-06	$ -	$ -
12.00	0.5	6.02000	95.60	203.00	330.0	480.0	-0.25335	1.241315	0.001737707	1.57184E-06	$ 67.10	$ 67.10
12.00	1	3.51000	54.10	114.00	184.0	267.0	-0.10929	0.713735	0.000813128	1.11971E-06	$ 73.94	$ 73.94
12.00	1.5	2.53000	38.60	80.80	130.0	189.0	-0.09864	0.517972	0.000442636	1.11364E-06	$ 80.79	$ 80.79
12.00	2	2.04000	30.90	64.70	104.0	151.0	-0.06195	0.413848	0.00036715	8.37506E-07	$ 87.63	$ 87.63
12.00	2.5	1.72000	26.10	54.40	87.7	127.0	-0.02055	0.346655	0.00033339	6.31164E-07	$ 94.48	$ 94.48
12.00	3	1.50000	22.70	47.30	76.3	110.0	0.011479	0.298008	0.000337278	3.94477E-07	$ 101.33	$ 101.33
12.00	3.5	1.34000	20.20	42.10	67.9	98.1	0.005965	0.266414	0.000282229	4.12684E-07	$ 108.17	$ 108.17
12.00	4	1.21000	18.30	38.20	61.4	88.7	-0.0156	0.243013	0.00024248	3.91443E-07	$ 115.02	$ 115.02
12.00	4.5	1.11000	16.80	34.90	56.2	81.2	-0.00729	0.223224	0.000210358	3.91443E-07	$ 121.87	$ 121.87
12.00	5	1.03000	15.50	32.40	52.1	75.3	-0.00722	0.205439	0.000211022	3.24685E-07	$ 128.71	$ 128.71
12.00	5.5	0.97200	14.60	30.50	49.1	70.9	0.00243	0.192662	0.000207915	2.81596E-07	$ 135.56	$ 135.56
12.00	6	0.91400	13.80	28.70	46.1	66.6	-0.01265	0.184164	0.000166249	3.2954E-07	$ 142.41	$ 142.41

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Changes from Recent Filing:

12.8 Demand Control Ventilation

Algorithms

$$Customer\ kW = Total\ Exaust\ Fan\ HP \times ESF$$

$$Customer\ kWh = Customer\ kW \times Hours$$

$$Customer\ Dth = Total\ Exhaust\ Fan\ HP \times GSF$$

Variables

ESF	0.9054	Demand Controlled Ventilation Electric Savings Factor, kW per name plate HP. (Ref 49)
GSF	42.3224	Demand Controlled Ventilation Gas Savings Factor =42.3224 Dth per name plate hp. (Ref 49)

Customer Inputs	**M&V Verified**	
Model Name	Yes	
Model Number	Yes	
Quantity	Yes	
Size	Yes	
Total Exhaust Fan hp	Yes	Total nameplate HP of exhaust fans with DCV installed.

Table 12.1.8 Ref (53, 54)	**Incremental Cost Per Name Plate HP**	**Measure Life (yrs)**	**Coincidence Factor (CF)**	**O&M Savings - energy Per Name Plate HP**	**Hours**
Demand Controlled Ventilation	$ 2,451.55	20	49.46%	$0	3307

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Changes from Recent Filing:

12.9 Destratification Fans

Algorithms

$$Customer\ (Dth) = \left(U\ roof \times (Area\ Destrat \times deltaT\ C) + U\ wall \times \sqrt{\frac{Area\ Destrat}{\%\ of\ Space\ Area}} \times 4 \times \%\ of\ Space\ Area \times Ceilingheight \times Destrat\ Height \times deltaT\ C \right) \times HeatingHours \times \frac{\frac{HrsPerDay}{24}}{\frac{HeatEff}{1000000}} + Destrat\ Fan\ kWh \times \left(\frac{3412}{HeatEff} - Source\ BTU\ Factor\right)/1000000$$

Variables

HeatingHours	6242	Heating hours in season with outdoor air temperatures below 65F. (Ref 48)
% of Space Area	80%	Engineering assumption of destratified area/total area of the space
deltaT_C	10	Difference between ceiling air temperature (deg F) and floor temperature in stratified space. Ref (48)
Destrat_Height	0.25	Assumption that the top 25% of the wall height will experience the same stratified deltaT as the ceiling.
U_roof	0.08	Average heat transfer coefficient for the roof (BTU/h*ft^2*F). (Ref 48)
U_walls	0.115	Average heat transfer coefficient for the walls (BTU/h*ft^2*F) assuming equal distribution between newer and older buildings. (Ref 43)
Heat_Eff	80%	Assumed efficiency of heating equipment.
Conversion Factor	1,000,000	Conversion factor from BTU to Dth.
Destrat_Fan_kW	0.588	kW per fan, based on typical 1 HP motor with 65% load factor.
Source_BTU_Factor	7500	Source BTU per kWh, used to account for cross-fuel penalty of this measure. (Ref 45)
Measure Life	See Table 12.1.0	Refer to table 15 for measure life.

Customer Inputs	**M&V Verified**	
HrsPerDay	Yes	Hours per day of destratification fan operation.
Qty	Yes	Quantity of destratification fans installed.
Ceiling Height	Yes	Height of ceiling in space being destratified, in feet.
Area_Destrat	Yes	Total area being destratified, in square feet.
Cost	No	Total cost for equipment and installation of destratification fans.

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Changes from Recent Filing:

12.10 Boiler Controls

Algorithms

$$Customer\ Dth = Input\ Capacity \times Alt \times (1 - \frac{EFFb}{Effh}) \times EFLH$$

Variables

Alt	1	Altitude Adjustment factor to adjust the sea level manufacturer's rated input for altitude effects. No adjustment for near sea-level altitude.
Effb	See Table 12.2.0	Efficiency of Baseline equipment.
Effh	See Table 12.2.0	Efficiency of equipment after controls implemented
EFLH	See Table 12.3.0	Based on Bin Analysis assuming 30% oversizing for boiler plant. (Ref 28)
Measure Life	See Table 12.1.0	

Customer Inputs	**M&V Verified**	
Input Capacity	Yes	Rated input BTUH nameplate data for the boiler
Use	Yes	Use of boiler: space heating, domestic water, or both.
Cost	Yes	Cost of boiler tuneup

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3. International Energy Conservation Code (IECC) 2015 Table C403.2.3 (4)
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41. Wisconsin Focus on Energy, ECM Furnace Fan Impact Evaluation Report, https://focusonenergy.com/sites/default/files/emcfurnaceimpactassessment_evaluationreport.pdf)
42. MN custom rebates and conversations with Distributors (Tim Stoklosa, Clean Energy Designs in Lakewood CO)
43. Illinois 2017 TRM ; http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_6/Final/IL-TRM_Effective_010118_v6.0_Vol_2_C_and_I_020817_Final.pdf
44. St Paul 2015 Water Rate Schedule - http://mn-stpaul.civicplus.com/DocumentView.asp?DID=3493 (From 2017-2019 MN Energy Efficient Showerhead Tech Assumptions)
45. Source BTU for electricity based on MN DOC No. G008/CIP-00-864.07 Reply Comments of May 23, 2003 which states a Source BTU comparison must be made using an assumed heat rate of 7500 BTU/Generator kWh , based on typical Heat Rate for Combined-Cycle Natural Gas-fired Plant.
46. Wisconsin Focus on Energy 2019 TRM
47. Historical program participation
48. State of Minnesota Technical Reference Manual for Energy Conservation Improvement Programs version 3.0 Jan 10 2019
49. Custom DCV Projects, 2010-2011
50. MN Lighting Efficiency Tech Assumption , Tab "Forcast Market Segment".
51. 2011 Tetratech Program Evaluation

Changes from Recent Filing:

New linkageless boiler controls measure

Table 12.1.0 Measure Lives

Hot Water Boilers (Non Condensing)	Product Life (yrs)	Source of Information
Hot Water Boiler - Non-condensing 175 MBTUH	20	Reference 3
Hot Water Boiler - Non-condensing 500 MBTUH	20	Reference 3
Hot Water Boiler - Non-condensing 1MMBTUH	20	Reference 3
Hot Water Boiler - Non-condensing 2 MMBTUH	20	Reference 3
Hot Water Boiler - Non-condensing 4 MMBTUH	20	Reference 3
Hot Water Boiler - Non-condensing 6 MMBTUH	20	Reference 3
Hot Water Boiler - Non-condensing 8, MMBTUH	20	Reference 3
Hot Water Boilers (Condensing)		
Hot Water Boiler - Condensing 175 MBTUH	20	Reference 3
Hot Water Boiler - Condensing 500 MBTUH	20	Reference 3
Hot Water Boiler - Condensing 1 MMBTUH	20	Reference 3
Hot Water Boiler - Condensing 2 MMBTUH	20	Reference 3
Hot Water Boiler - Condensing 4 MMBTUH	20	Reference 3
Hot Water Boiler - Condensing 6 MMBTUH	20	Reference 3
Hot Water Boiler - Condensing 8 MMBTUH	20	Reference 3
Low Pressure Steam Boilers		
Low Pressure Steam Boiler - 300 MBTUH	20	Reference 3
Low Pressure Steam Boiler - 1 MMBTUH	20	Reference 3
Low Pressure Steam Boiler - 10 MMBTUH	20	Reference 3
High Pressure Steam Boilers		
High Pressure Steam Boiler - 300 MBTUH	20	Reference 3
High Pressure Steam Boiler - 1 MMBTUH	20	Reference 3
High Pressure Steam Boiler - 10 MMBTUH	20	Reference 3
Boiler Tune up		
Gas Boiler condensing or non-condensing	2	D.O.E
Outdoor Air Reset		
Gas Boiler condensing or non-condensing	20	Reference 51
Stack Dampers		
Gas Boiler condensing or non-condensing	12	Reference 51
Linkageless Controls		
Gas Boiler condensing or non-condensing	16	Reference 43
Modulating Burners		
Gas Boiler condensing or non-condensing	20	Reference 3
Turbulators		
Gas Boiler condensing or non-condensing	20	Reference 3
O2 Trim Control		
Gas Boiler condensing or non-condensing	20	Reference 51
Water Heaters		
Storage Water Heater	15	Reference 35
Tankless Water Heater	20	Reference 35
Steam Traps		
Gas Boiler - Steam Traps - Low and High Pressure	5	Reference 4
Pipe Insulation		
Insulation - Hot Water System	13	Reference 51
Insulation - Steam System	13	Reference 51
Heating System Optimization Study		
Heating System Optimization Study	0	
Implementation - Boiler measures	7	Past Recommissioning projects
Implementation - Steam System measures	7	Past Recommissioning projects
Implementation - Heat Recovery measures	7	Past Recommissioning projects
High Efficiency Furnace	20	Reference 48
Unit Heaters		
Unit Heaters - Non-Condensing	20	
Unit Heaters - Condensing	20	
Unit Heaters - Infrared	15	
Destratification Fans	15	Reference 48

Table12.2.0 Heating Equipment Efficiencies

	Baseline Efficiency (EFFb)	Efficient Efficiency (EFFh)	Unit	Reference
New Boilers (Non-Condensing) <300,000 BTU/h 2012 IECC	82.0%	85.0%*	AFUE	Ref. 11
New Boilers (Non-Condensing) >= 300,000 BTU/h and <=2,500,000 BTU/h	80.0%	85.0%*	Et (Thermal Eff)	Ref. 11
New Boilers (Non-Condensing) >2,500,000 BTU/h	82.0%	85.0%*	Ec (Combustion Eff)	Ref. 11
New Boilers (Condensing) <300,000 BTU/h	82.0%	88.0%*	AFUE	Ref. 48
New Boilers (Condensing) >= 300,000 BTU/h and <=2,500,000 BTU/h	80.0%	88.0%*	Et (Thermal Eff)	Ref. 48
New Boilers (Condensing) >2,500,000 BTU/h	82.0%	88.0%*	Ec (Combustion Eff)	Ref. 48
Retrofit Boilers <300,000 BTU/h	78.0%	88.0%*	AFUE	Ref. 48
Retrofit Boilers >=300,000 BTU/h and <=2,500,000 BTU/h	78.0%	88.0%*	Et (Thermal Eff)	Ref. 48
Retrofit Boilers >2,500,000 BTU/h	78.0%	88.0%*	Ec (Combustion Eff)	Ref. 48
Low Pressure Steam Boilers <300,000 BTU/h	80% **	81.0%*	Et (Thermal Eff)	
Low Pressure Steam Boilers >=300,000 BTU/h	79% **	81.0%*	Et (Thermal Eff)	Ref. 6
High Pressure Steam Boilers <300,000 BTU/h	80% **	81.0%*	Et (Thermal Eff)	
High Pressure Steam Boilers >=300,000 BTU/h	79% **	81.0%*	Et (Thermal Eff)	Ref. 6
Boiler Tune Up (Non-Condensing)	78.0%	80.0%		Ref. 12
Boiler Tune Up (Condensing)	87.2%	88.0%		Ref. 21
Outdoor Air Reset	80.0%	83.0%		Ref. 13
Stack Dampers	80.0%	81.0%		Ref. 14
Modulating Burner Controls	80.0%	83.0%		Ref. 15
O2 Trim Control	80.0%	82.0%		Ref. 16
Steam Traps	80.0%	N/A		Ref. 17
Turbulators	80.0%	83.0%		
Linkageless Controls	80.0%	83.0%		Ref. 42
Commercial Furnaces < 225,000 BTUH input	78.0%	92.0%*	AFUE	Ref. 3
Commercial Furnaces >= 225,000 BTUH input	80.0%	92.0%*	Et (Thermal Eff)	Ref. 3
Water Heaters	80.0%	92.0%*		Ref. 18
Unit Heater (Non-condensing)	80.0%	83.0%*		Ref. 3
Unit Heater (Condensing)	80.0%	90.0%*		Ref. 3
Pipe Insulation	80.0%	N/A		Ref 17

* High efficiency boiler and furnace efficiencies are per customer. Listed efficiencies are minimum qualifying efficiencies.
** All steam boilers are assumed to be forced draft

Table 12.3.0 Effective Full Load Heating Hours (Ref 28, 47, 48)

Equipment	Use	Hours	Explanation
Boiler	Space Heating Only	1,832	Based on MN TRM Table of EFLH weighted average calculated from historical participation
	Domestic Hot Water Only	2,187	Based on Bin Analysis assuming Constant 25% load and 30% oversizing
	Space Heating and Domestic Hot Water	2,307	Based on Bin Analysis assuming constant 15% load and 30% oversizing for the DHW and TRM values for space heating
Furnace	All	849	Based on Bin Analysis assuming 15% oversize factor

13.1 Lighting Controls

Algorithms

$$Customer\ kW = kW\ Connected \times \%\ Savings \times Cooling\ kW\ Savings\ Factor$$

$$Customer\ kWh = kW\ Connected \times \%\ Savings \times Hours \times Cooling\ kWh\ Savings\ Factor$$

$$Customer\ PCkW = kW\ Connected \times \%Savings \times Cooling\ kW\ Savings\ Factor \times CF$$

$$Natural\ Gas\ Savings\ (Dth) = kW\ Connected \times \%\ Savings \times Hours \times Heating\ Penalty\ Factor$$

Variables

Cooling_kW_Savings_Factor	See Table 13.1.0	Cooling system secondary demand savings factor resulting from efficient lighting. Reduction in lighting demand results in a reduction in cooling demand, if the customer has air conditioning. Existence of air conditioning determined by HVAC_Type.
Cooling_kWh_Savings_Factor	See Table 13.1.0	Cooling system secondary energy savings factor resulting from efficient lighting. Reduction in lighting energy results in a reduction in cooling energy, if the customer has air conditioning. Existence of air conditioning determined by HVAC_Type.
Heating_Penalty_Factor	See Table 13.1.0	Heating system secondary energy penalty factor resulting from efficient lighting. Reduction in lighting demand results in an increase in heating usage, if the customer has gas heating. Existence of gas heating to be determined by HVAC_Type.
CF	See Table 13.3.0	Coincidence Factor is the probability that the peak demand of the lights will coincide with the peak utility system demand, determined by Facility_Type.
Hours	See Table 13.3.0	Annual operating hours, determined by Facility_Type.
% Savings	See Table 13.1.1	Stipulated savings percentage based on control type.
Measure Life	See Table 13.2.0	Length of time the lighting equipment will be operational.
NTG	100%	Net-to-gross.

Customer Inputs	**M&V Verified**	
HVAC_Type	Yes	Type of heating or cooling, verified during M&V.
Facility_Type	No	Type of facility.
kW_Connected	Yes	Total connected fixture load connected to lighting controls, provided by customer and verified during M&V.

Table 13.1.1 Lighting Controls [4, 5]

Control Type	% Savings	Full Cost Per Watt
Standalone - Occupancy Sensor	24%	$0.61
Standalone - Daylighting (Photocell) Sensor	28%	$0.61
Standalone - Occupancy and Daylighting (Photocell)	38%	$0.61
Networked Lighting Controls	47%	$1.57

References:

1. HVAC Interactive Factors developed based on the Rundquist Simplified HVAC Interaction Factor method for Minnesota, ASHRAE Journal - "Calculating lighting and HVAC
2. COP values from the Deemed Savings for CO Commercial Refrigeration, 2019-2020. (Cooler and Freezer Door Interactive Factors).
3. State of Minnesota Technical Reference Manual, Version 3.1 Final Technical Version as of January 20th, 2020. Effective January 1st, 2021. (Hours and CF)
4. Design Lights Consortium. (2017). Energy Savings from Networked Lighting Control (NLC) Systems. Medford: Design Lights Consortium. Retrieved 1 23, 2020, from
5. Lawrence Berkeley National Laboratory. (2011). A Meta-Analysis of Energy Savings from Lighting Controls in Commercial Buildings. Berkeley, CA: Lawrence Berkeley National
6. Measure Life for automatically controlled measures from the Deemed Savings for CO Energy Management Systems, 2019-2020. (NLC Measure Life)
7. Design Lights Consortium (2018). Qualified Products List as of February 27, 2018. (Lamp Lifetime Hours)
8. Hours of Use to calculate measure life for lamps was determined using a weighted hours of operation from Xcel Energy 2018/2019 participation.
9. LED baseline and proposed costs come from previous Xcel Energy Custom Lighting Efficiency projects, as well as market research through ShineRetrofits.com,
10. "Lighting Efficiency - MN" and "Lighting - Small Business" participation data from 2016 through 2018.
11. Deemed Savings for 2021-2023 "Product: Lighting Efficiency - MN" to reference deemed values used to create weighted averages for HVAC Interactive Factors, Hours and
12. Energy Independence and Security Act. United States Congress. Jan 4, 2007. http://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/eisa_2007.pdf
13. Adoption of Light-Emitting Diodes in Common Lighting Applications. Prepared for the U.S. Department Of Energy by Navigant Consulting. April 2013.
14. Caliper Benchmark Report - Performance of Incandescent A-Type and Decorative Lamps and LED Replacements. U.S. Department of Energy. November, 2008.
15. ENERGY STAR ® Integral LED Product Qualifications Requirements. 2010.
16. Caliper Benchmark Report - Performance of Halogen Incandescent MR 16 Lamps and LED Replacements. U.S. Department of Energy. November, 2008.
17. Incandescent Reflector Lamps minimum efficacy standards. http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/58
18. ENERGY STAR ® Certified Light Bulbs and Light Fixtures Qualified Products Lists. Accessed July 2018.
19. Actual sales data from distributors from 2017-2018. (Baseline Distributor Costs)
20. Design Lights Consortium (2018). Qualified Products List as of February 27, 2018. (Lamp Lifetime Hours)
21. Compared lumen equivalency data in the CO Lighting Efficiency downstream program from 2018 and 2019 to identify the baseline equivalency factors for the lamps.
22. "What is a ballast factor, and how does it affect my fluorescent tubes?". July 7, 2016. https://insights.regencylighting.com/what-is-a-ballast-factor-and-how-does-it-affect-my-
23. Power Factor.https://assets.osram-americas.com/assets/documents/FAQ0056-0605.8d13d344-4cd2-42f2-af91-100b2a1a8a4d.pdf

Changes from Recent Filing:

13.2 Lighting Retrofit

Algorithms

$$Customer\ kW = (kW\ Exist - kW\ Prop) \times Cooling\ kW\ Savings\ Factor$$

$$Customer\ kWh = (kW\ Exist - kW\ Prop) \times Cooling\ kWh\ Savings\ Factor$$

$$Customer\ PCkW = (kW\ Exist - kW\ Prop) \times Hours \times Cooling\ kW\ Savings\ Factor \times CF$$

$$kW\ Exist = QTY\ Existing\ Equip \times Existing\ Model\ kW$$

$$kW\ Prop = QTY\ Prop\ Equip \times Equipment\ Model\ kW$$

$$Natural\ Gas\ Savings\ (Dth) = (kW\ Exist - kW\ Prop) \times Hours \times Heating\ Penalty\ Factor$$

Variables

Cooling_kW_Savings_Factor	See Table 13.1.0	Cooling system secondary demand savings factor resulting from efficient lighting. Reduction in lighting demand results in a reduction in cooling demand, if the customer has air conditioning. Existence of air conditioning determined by HVAC_Type.
Cooling_kWh_Savings_Factor	See Table 13.1.0	Cooling system secondary energy savings factor resulting from efficient lighting. Reduction in lighting energy results in a reduction in cooling energy, if the customer has air conditioning. Existence of air conditioning determined by HVAC_Type.
Heating_Penalty_Factor	See Table 13.1.0	Heating system secondary energy penalty factor resulting from efficient lighting. Reduction in lighting demand results in an increase in heating usage, if the customer has gas heating. Existence of gas heating to be determined by HVAC_Type.
CF	See Table 13.3.0	Coincidence Factor is the probability that the peak demand of the lights will coincide with the peak utility system demand, determined by Facility_Type.
Hours	See Table 13.3.0	Annual operating hours, determined by Facility_Type.
Measure Life	See Table 13.2.0	Length of time the lighting equipment will be operational.
NTG	100%	Net-to-gross.

Customer Inputs	**M&V Verified**	
Qty_Existing_Equip	No	Quantity of existing equipment, verified during M&V.
Qty_Prop_Equip	Yes	Quantity of proposed equipment, verified during M&V.
HVAC_Type	Yes	Type of heating or cooling, verified during M&V.
Facility_Type	No	Type of facility.
Existing_Model_kW	No	Existing equipment wattage determined from stipulated fixture or lamp wattage. Specific lighting product provided by customer and verified during M&V.
Equipment_Model_kW	Yes	Proposed equipment wattage of fixture or lamp. Specific lighting product provided by customer and verified during M&V.
Baseline Cost	No	Cost of the baseline technology. For Retrofit, the cost is $0.00 since the baseline is to continue to operate the existing system. For New Construction, the cost is that of the lower efficiency option. Costs are determined through market research and provided by vendors.
High Efficiency Cost	No	Cost of the High Efficiency technology. [9] Equipment and Labor costs are also collected on a per measure basis, data is used to evaluate and identify the need to update costs as needed throughout the year to account for the rapidly evolving market.

References:

1. HVAC Interactive Factors developed based on the Rundquist Simplified HVAC Interaction Factor method for Minnesota, ASHRAE Journal - "Calculating
2. COP values from the Deemed Savings for CO Commercial Refrigeration, 2019-2020. (Cooler and Freezer Door Interactive Factors).
3. State of Minnesota Techncial Reference Manual, Version 3.1 Final Technical Version as of January 20th, 2020. Effective January 1st, 2021. (Hours and
4. Design Lights Consortium. (2017). Energy Savings from Networked Lighting Control (NLC) Systems. Medford: Design Lights Consortium. Retrieved 1 23,
5. Lawrence Berkeley National Laboratory. (2011). A Meta-Analysis of Energy Savings from Lighting Controls in Commercial Buildings. Berkeley, CA:
6. Measure Life for automatically controlled measures from the Deemed Savings for CO Energy Management Systems, 2019-2020. (NLC Measure Life)
7. Design Lights Consortium (2018). Qualified Products List as of February 27, 2018. (Lamp Lifetime Hours)
8. Hours of Use to calculate measure life for lamps was determined using a weighted hours of operation from Xcel Energy 2018/2019 participation.
9. LED baseline and proposed costs come from previous Xcel Energy Custom Lighting Efficiency projects, as well as market research through
10. "Lighting Efficiency - MN" and "Lighting - Small Business" participation data from 2016 through 2018.
11. Deemed Savings for 2021-2023 "Product: Lighting Efficiency - MN" to reference deemed values used to create weighted averages for HVAC Interactive
12. Energy Independence and Security Act. United States Congress. Jan 4, 2007.
13. Adoption of Light-Emitting Diodes in Common Lighting Applications. Prepared for the U.S. Department Of Energy by Navigant Consulting. April 2013.
14. Caliper Benchmark Report - Performance of Incandescent A-Type and Decorative Lamps and LED Replacements. U.S. Department of Energy.
15. ENERGY STAR ® Integral LED Product Qualifications Requirements. 2010.
16. Caliper Benchmark Report - Performance of Halogen Incandescent MR 16 Lamps and LED Replacements. U.S. Department of Energy. November,
17. Incandescent Reflector Lamps minimum efficacy standards. http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/58
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19. Actual sales data from distributors from 2017-2018. (Baseline Distributor Costs)
20. Design Lights Consortium (2018). Qualified Products List as of February 27, 2018. (Lamp Lifetime Hours)
21. Compared lumen equivalency data in the CO Lighting Efficiency downstream program from 2018 and 2019 to identify the baseline equivalency factors
22. "What is a ballast factor, and how does it affect my fluorescent tubes?". July 7, 2016. https://insights.regencylighting.com/what-is-a-ballast-factor-and-
23. Power Factor.https://assets.osram-americas.com/assets/documents/FAQ0056-0605.8d13d344-4cd2-42f2-af91-100b2a1a8a4d.pdf

Changes from Recent Filing:

13.3 Lighting Midstream

Algorithms

$$Customer\ kW = Quantity \times \frac{Watts\ Base - Watts\ EE}{1000} \times Cooling\ kW\ Savings\ Factor$$

$$Customer\ kWh = Quantity \times \frac{Watts\ Base - Watts\ EE}{1000} \times Hours \times Cooling\ kWh\ Savings\ Factor$$

$$Customer\ PCkW = Quantity \times \frac{Watts\ Base - Watts\ EE}{1000} \times Cooling\ kW\ Savings\ Factor \times CF$$

$$LPW\ EE = (Lumens\ EE)/(Watts\ EE)$$

$$Watts\ Base = Watts\ EE \times \frac{LPW\ EE}{LPW\ Base}$$

$$Natural\ Gas\ Savings\ (Dth) = Quantity \times \frac{Watts\ Base - Watts\ EE}{1000} \times Hours \times Heating\ Penalty\ Factor$$

Applies to: LED Linear Lamps - Type B & C, LED PL/G based CFL Replacement lamp - Type B, LED Screw-in Lamps - HID Replacement

$$Watts\ Base = Watts\ EE \times \frac{LPW\ EE}{LPW\ Base \times Baseline\ Equivelancy\ Factor \times Ballast\ Factor}$$

*Rest of the equations are the same as the first table

Applies to: LED Linear Lamps - Type A, LED PL/G based CFL Replacement lamp - Type A

$$Customer\ kW = Quantity \times \frac{Watts\ Base - Sys\ Watts\ EE}{1000} \times Cooling\ kW\ Savings\ Factor$$

$$Customer\ kWh = Quantity \times \frac{Watts\ Base - Sys\ Watts\ EE}{1000} \times Hours \times Cooling\ kWh\ Savings\ Factor$$

$$Customer\ PCkW = Quantity \times \frac{Watts\ Base - Sys\ Watts\ EE}{1000} \times Cooling\ kW\ Savings\ Factor \times CF$$

$$Watts\ Base = Watts\ EE \times \frac{LPW\ EE}{LPW\ Base \times Baseline\ Equivelancy\ Factor \times Ballast\ Factor}$$

$$Sys\ Watts\ EE = (Watts\ EE)/(Ballast\ Efficiency)$$

Variables

LPW_Base	See Table 13.1.3	Efficacy of the baseline technology (lumens per watt).
Cooling_kW_Savings_Factor	1.23	Reduction in lighting demand results in a reduction in cooling demand, if the customer has air conditioning. The program will not have direct access to market segment information, so a deemed weighted average was created based on a three year history of downstream participation. [1, 2]
Cooling_kWh_Savings_Factor	1.08	Reduction in lighting energy results in a reduction in cooling energy, if the customer has air conditioning. The program will not have direct access to market segment information, so a deemed weighted average was created based on a three year history of downstream participation. [1, 2]
Heating_Penalty_Factor	-0.000683	Reduction in lighting energy results in an increase in heating usage, if the customer has gas heating (Dth/kWh). [2]
CF	80%	Coincidence Factor is the probability that the peak demand of the lights will coincide with peak utility system demand. The program will not have direct access to market segment information, so a deemed weighted average was created based on a three year history of downstream participation. [1, 2]
Hours	5,341	Annual operating hours. The program will not have direct access to market segment information, so a deemed weighted average based on a three year history of downstream participation was created. [1, 2]
Ballast_Factor	88%	Ballast factor is the measured ability of a fluorescent ballast to produce light from the lamp(s) it powers. In addition to the effect on light output, there is also an indirect impact on energy consumption. A normal ballast factor is assumed here. [16]
Ballast_Efficiency	85%	There is an inefficiency when an LED lamp is running off of a ballast, which adds additional wattage to the nominal lamp wattage. Ballast efficiency may also be referred to as power factor in general terms. Power factor is the fraction of power actually used by the ballast compared to the total power supplied. The ballast efficiency accounts for this inefficiency. [17]
Baseline_Equivalency_Factor	See Table 13.2.3	Accounts for differences in luminaire efficiency (ratio of light emitted by the fixture to the lumen output of the lamp-ballast system alone), lumen depreciation over time, and overdesigned spaces.
Measure Life	See Table 13.3.3	Length of time the lighting equipment will be operational, equals the lifetime hours of the lamp divided by the deemed hours of use.
Baseline Cost	See Table 13.4.3	Cost of the baseline technology.
Labor Cost	See Table 13.5.3	Cost of labor to install the Type B and Type C lamps. [1]
NTG	92%	Net-to-gross factor. [3]

Customer Inputs	M&V Verified	
Quantity	No	Quantity of lamps or retrofit kits.
Measure Category	No	Type of lamp or retrofit kit.
Watts_EE	No	High efficiency lamp wattage. This is defined by the manufacturer and maintained and reported by the distributor.
Lumens_EE	No	High efficiency lamp rated brightness (lumens). This is defined by the manufacturer and maintained and reported by the distributor.
High Efficiency Cost	No	Cost of the high efficiency technology. Costs will be collected from the equipment distributor on the product invoice.

Table 13.1.3 Baseline Lamp Efficacy based on Lamp Category [12 - 17]

Measure Category	Avg. Efficacy
A Lamp rated for 310 - 749 Lumens	27.12
A Lamp rated for 750 - 1049 Lumens	36.88
A Lamp rated for 1050 - 1489 Lumens	39.45
A Lamp rated for 1490 - 2600 Lumens	37.93
General Directional (PAR, BR, R)	18.69
Multifaceted Reflector (MR16)	13.00
Decorative (B, BA, Candle, Globe)	10.45
Downlight Retrofit Kit	24.39
Fluorescent Linear Lamps	88.70
PL/G based CFL lamp	69.30
HID Screw-in Lamp	83.20

Table 13.2.3 Baseline Equivalency Factor (BEF) [21]

Measure Category	BEF
LED Linear Lamps - Type A	0.70
LED Linear Lamps - Type B, C	0.87
LED PL/G based CFL Replacement Lamp	0.52
LED Screw-in Lamps, HID Replacement	0.62

Table 13.3.3 Measure Lifetimes in Years [8, 18, 20]

Measure Category	Lifetime
LED Interior Lamp - A Lamp	4.0
General Directional (PAR, BR, R)	4.7
Multifaceted Reflector (MR16)	4.7
Decorative (B, BA, Candle, Globe)	3.5
Downlight Retrofit Kit	8.6
LED Linear Lamps - Type A	9.0
LED Linear Lamps - Type B	10.0
LED Linear Lamps - Type C	20.0
LED PL/G based CFL Replacement lamp	10.7
LED Screw-in Lamps, HID Replacement	7.8

Table 13.4.3 Baseline Costs [19]

Measure Category	Baseline Cost
A19 60W, 750-1049 lm	$2.84
A19 100W, 1490-2600 lm	$3.48
Decorative (Candle/Globe)	$1.85
BR30	$3.34
BR40	$7.48
MR16	$8.65
PAR16	$12.32
PAR20	$6.29
R20	$4.30
PAR30	$10.96
PAR38	$11.70
Downlight Retrofit Kit	$8.41
LED Linear Lamps - Type A	$2.25
LED Linear Lamps - Type B	$2.68
LED Linear Lamps - Type C	$2.06
LED PL/G based CFL Replacement lamp	$3.44
LED Screw-in Lamps, HID Replacement	$32.06

Table 13.5.3 Labor Costs[10]

Measure Category	Labor Cost
LED Linear Lamps - Type B	$8.00
LED Linear Lamps - Type C	$12.00
LED PL/G based CFL Replacement Lamp - Type B	$12.00
LED Screw-in Lamps, HID Replacement	$55.00

References:

1. HVAC Interactive Factors developed based on the Rundquist Simplified HVAC Interaction Factor method for Minnesota, ASHRAE Journal - "Calculating lighting and HVAC interactions".
2. COP values from the Deemed Savings for CO Commercial Refrigeration, 2019-2020. (Cooler and Freezer Door Interactive Factors).
3. State of Minnesota Technical Reference Manual, Version 3.1 Final Technical Version as of January 20th, 2020. Effective January 1st, 2021. (Hours and CF)
4. Design Lights Consortium. (2017). Energy Savings from Networked Lighting Control (NLC) Systems. Medford: Design Lights Consortium. Retrieved 1 23, 2020, from https://www.designlights.org/lighting-
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6. Measure Life for automatically controlled measures from the Deemed Savings for CO Energy Management Systems, 2019-2020. (NLC Measure Life)
7. Design Lights Consortium (2018). Qualified Products List as of February 27, 2018. (Lamp Lifetime Hours)
8. Hours of Use to calculate measure life for lamps was determined using a weighted hours of operation from Xcel Energy 2018/2019 participation.
9. LED baseline and proposed costs come from previous Xcel Energy Custom Lighting Efficiency projects, as well as market research through ShineRetrofits.com, LightingAtlanta.org, 1000bulbs.com,
10. "Lighting Efficiency - MN" and "Lighting - Small Business" participation data from 2016 through 2018.
11. Deemed Savings for 2021-2023 "Product: Lighting Efficiency - MN" to reference deemed values used to create weighted averages for HVAC Interactive Factors, Hours and CF.
12. Energy Independence and Security Act. United States Congress. Jan 4, 2007. http://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/eisa_2007.pdf
13. Adoption of Light-Emitting Diodes in Common Lighting Applications. Prepared for the U.S. Department Of Energy by Navigant Consulting. April 2013.
14. Caliper Benchmark Report - Performance of Incandescent A-Type and Decorative Lamps and LED Replacements. U.S. Department of Energy. November, 2008.
15. ENERGY STAR ® Integral LED Product Qualifications Requirements. 2010.
16. Caliper Benchmark Report - Performance of Halogen Incandescent MR 16 Lamps and LED Replacements. U.S. Department of Energy. November, 2008.
17. Incandescent Reflector Lamps minimum efficacy standards. http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/58
18. ENERGY STAR ® Certified Light Bulbs and Light Fixtures Qualified Products Lists. Accessed July 2018.
19. Actual sales data from distributors from 2017-2018. (Baseline Distributor Costs)
20. Design Lights Consortium (2018). Qualified Products List as of February 27, 2018. (Lamp Lifetime Hours)
21. Compared lumen equivalency data in the CO Lighting Efficiency downstream program from 2018 and 2019 to identify the baseline equivalency factors for the lamps.
22. "What is a ballast factor, and how does it affect my fluorescent tubes?". July 7, 2016. https://insights.regencylighting.com/what-is-a-ballast-factor-and-how-does-it-affect-my-fluorescent-tubes
23. Power Factor.https://assets.osram-americas.com/assets/documents/FAQ0056-0605.8d13d344-4cd2-42f2-af91-100b2a1a8a4d.pdf

Changes from Recent Filing:

Addition of Ballast Factor, Ballast Efficiency & Baseline Equivalency Factor for determining lamp efficacy
Added Labor Cost of install or Type B & C lamps

13.4 Lighting New Construction

Algorithms

$$Customer\ kW = (kW\ Exist - kW\ Prop) \times Cooling\ kW\ Savings\ Factor$$

$$Customer\ kWh = (kW\ Exist - kW\ Prop) \times Cooling\ kWh\ Savings\ Factor$$

$$Customer\ PCkW = (kW\ Exist - kW\ Prop) \times Hours \times Cooling\ kW\ Savings\ Factor \times CF$$

$$kW\ Exist = QTY\ Existing\ Equip \times Existing\ Model\ kW$$

$$kW\ Prop = QTY\ Prop\ Equip \times Equipment\ Model\ kW$$

$$Natural\ Gas\ Savings\ (Dth) = (kW\ Exist - kW\ Prop) \times Hours \times Heating\ Penalty\ Factor$$

Variables

Cooling_kW_Savings_Factor	See Table 13.1.0	Cooling system secondary demand savings factor resulting from efficient lighting. Reduction in lighting demand results in a reduction in cooling demand, if the customer has air conditioning. Existence of air conditioning determined by HVAC_Type.
Cooling_kWh_Savings_Factor	See Table 13.1.0	Cooling system secondary energy savings factor resulting from efficient lighting. Reduction in lighting energy results in a reduction in cooling energy, if the customer has air conditioning. Existence of air conditioning determined by HVAC_Type.
Heating_Penalty_Factor	See Table 13.1.0	Heating system secondary energy penalty factor resulting from efficient lighting. Reduction in lighting demand results in an increase in heating usage, if the customer has gas heating. Existence of gas heating to be determined by HVAC_Type.
CF	See Table 13.3.0	Coincidence Factor is the probability that the peak demand of the lights will coincide with the peak utility system demand, determined by Facility_Type.
Hours	See Table 13.3.0	Annual operating hours, determined by Facility_Type.
Measure Life	See Table 13.2.0	Length of time the lighting equipment will be operational.
NTG	100%	Net-to-gross.

Customer Inputs	**M&V Verified**	
Qty_Prop_Equip	Yes	Quantity of proposed equipment, verified during M&V.
HVAC_Type	Yes	Type of heating or cooling, verified during M&V.
Existing_Model_kW	No	Existing equipment wattage determined from stipulated fixture or lamp wattage. Specific lighting product provided by customer and verified during M&V.
Equipment_Model_kW	Yes	Proposed equipment wattage of fixture or lamp. Specific lighting product provided by customer and verified during M&V.
Baseline Cost	No	For New Construction, the cost is that of the lower efficiency option. Costs are determined through market research and provided by vendors.
High Efficiency Cost	No	Cost of the High Efficiency technology. [9] Equipment and Labor costs are also collected on a per measure basis, data is used to evaluate and identify the need to update costs as needed throughout the year to account for the rapidly evolving market.

References:

1. HVAC Interactive Factors developed based on the Rundquist Simplified HVAC Interaction Factor method for Minnesota, ASHRAE Journal - "Calculating lighting and HVAC interactions".
2. COP values from the Deemed Savings for CO Commercial Refrigeration, 2019-2020. (Cooler and Freezer Door Interactive Factors).
3. State of Minnesota Techncial Reference Manual, Version 3.1 Final Technical Version as of January 20th, 2020. Effective January 1st, 2021. (Hours and CF)
4. Design Lights Consortium. (2017). Energy Savings from Networked Lighting Control (NLC) Systems. Medford: Design Lights Consortium. Retrieved 1 23, 2020, from
5. Lawrence Berkeley National Laboratory. (2011). A Meta-Analysis of Energy Savings from Lighting Controls in Commercial Buildings. Berkeley, CA: Lawrence Berkeley National Laboratory.
6. Measure Life for automatically controlled measures from the Deemed Savings for CO Energy Management Systems, 2019-2020. (NLC Measure Life)
7. Design Lights Consortium (2018). Qualified Products List as of February 27, 2018. (Lamp Lifetime Hours)
8. Hours of Use to calculate measure life for lamps was determined using a weighted hours of operation from Xcel Energy 2018/2019 participation.
9. LED baseline and proposed costs come from previous Xcel Energy Custom Lighting Efficiency projects, as well as market research through ShineRetrofits.com, LightingAtlanta.org,
10. "Lighting Efficiency - MN" and "Lighting - Small Business" participation data from 2016 through 2018.
11. Deemed Savings for 2021-2023 "Product: Lighting Efficiency - MN" to reference deemed values used to create weighted averages for HVAC Interactive Factors, Hours and CF.
12. Energy Independence and Security Act. United States Congress. Jan 4, 2007. http://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/eisa_2007.pdf
13. Adoption of Light-Emitting Diodes in Common Lighting Applications. Prepared for the U.S. Department Of Energy by Navigant Consulting. April 2013.
14. Caliper Benchmark Report - Performance of Incandescent A-Type and Decorative Lamps and LED Replacements. U.S. Department of Energy. November, 2008.
15. ENERGY STAR ® Integral LED Product Qualifications Requirements. 2010.
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23. Power Factor.https://assets.osram-americas.com/assets/documents/FAQ0056-0605.8d13d344-4cd2-42f2-af91-100b2a1a8a4d.pdf

Changes from Recent Filing:

13.5 Lighting DI

Algorithms

$$Customer\ kW = (kW\ Exist - kW\ Prop) \times Cooling\ kW\ Savings\ Factor$$

$$Customer\ kWh = (kW\ Exist - kW\ Prop) \times Cooling\ kWh\ Savings\ Factor$$

$$Customer\ PCkW = (kW\ Exist - kW\ Prop) \times Hours \times Cooling\ kW\ Savings\ Factor \times CF$$

$$kW\ Exist = QTY\ Existing\ Equip \times Existing\ Model\ kW$$

$$kW\ Prop = QTY\ Prop\ Equip \times Equipment\ Model\ kW$$

$$Natural\ Gas\ Savings\ (Dth) = (kW\ Exist - kW\ Prop) \times Hours \times Heating\ Penalty\ Factor$$

Variables

Cooling_kW_Savings_Factor	See Table 13.1.0	Cooling system secondary demand savings factor resulting from efficient lighting. Reduction in lighting demand results in a reduction in cooling demand, if the customer has air conditioning. Existence of air conditioning determined by HVAC_Type.
Cooling_kWh_Savings_Factor	See Table 13.1.0	Cooling system secondary energy savings factor resulting from efficient lighting. Reduction in lighting energy results in a reduction in cooling energy, if the customer has air conditioning. Existence of air conditioning determined by HVAC_Type.
Heating_Penalty_Factor	See Table 13.1.0	Heating system secondary energy penalty factor resulting from efficient lighting. Reduction in lighting demand results in an increase in heating usage, if the customer has gas heating. Existence of gas heating to be determined by HVAC_Type.
CF	See Table 13.5.1	Coincidence Factor is the probability that the peak demand of the lights will coincide with the peak utility system demand, determined by Facility_Type.
Hours	See Table 13.1.5	Annual operating hours, determined by Facility_Type.
Measure Life	25,000	Lifetime of lamps installed through the program in hours. Spec sheets provided by vendor
High Efficiency Cost	See Table 13.2.5	Deemed cost per proposed lamp
NTG	100%	Net-to-gross.

Customer Inputs	**M&V Verified**	
Qty_Existing_Equip	Yes	Quantity of existing equipment, verified during M&V.
Qty_Prop_Equip	Yes	Quantity of proposed equipment, verified during M&V.
HVAC_Type	Yes	Type of heating or cooling, verified during M&V.
Facility_Type	No	Type of facility.
Existing_Model_kW	Yes	Existing equipment wattage determined from stipulated fixture or lamp wattage. Specific lighting product provided by customer and verified during M&V.
Equipment_Model_kW	Yes	Proposed equipment wattage of fixture or lamp. Specific lighting product provided by customer and verified during M&V.
Baseline Cost	No	Cost of the baseline technology. For Retrofit, the cost is $0.00 since the baseline is to continue to operate the existing system. For New Construction, the cost is that of the lower efficiency option. Costs are determined through market research and provided by vendors.

Table 13.1.5 Multi Family Common-Area Space Type [3]	**Hours**	**CF**
Hallway	8,760	100%
Stairway	8,760	100%
Lobby/Atrium	5,950	75%
Management Office	5,950	75%
Laundry Room	5,950	75%
Community/Event Room	5,950	75%
Fitness Area	5,950	75%
Storage Area	5,950	75%
Mechanical Rooms	5,950	75%
Safety or Code Required	8,760	100%
Pool/Spa Area	5,950	75%
Parking Lot/Exterior	4,380	0%

Table 13.2.5 Multi Family Lamp Costs	**$/Lamp**
Multi-Family LED (10W PAR30)	$9.00
Multi-Family LED (11W BR30)	$6.75
Multi-Family LED (11W PAR30)	$9.00
Multi-Family LED (15W A21)	$9.00
Multi-Family LED (15W PAR38)	$10.00
Multi-Family LED (5W Candelabra)	$5.25
Multi-Family LED (6W Globe)	$5.50
Multi-Family LED (9W A19)	$4.80

References:

1. HVAC Interactive Factors developed based on the Rundquist Simplified HVAC Interaction Factor method for Minnesota, ASHRAE Journal - "Calculating lighting and HVAC interactions".
2. COP values from the Deemed Savings for CO Commercial Refrigeration, 2019-2020. (Cooler and Freezer Door Interactive Factors).
3. State of Minnesota Techncial Reference Manual, Version 3.1 Final Technical Version as of January 20th, 2020. Effective January 1st, 2021. (Hours and CF)
4. Design Lights Consortium. (2017). Energy Savings from Networked Lighting Control (NLC) Systems. Medford: Design Lights Consortium. Retrieved 1 23, 2020, from
5. Lawrence Berkeley National Laboratory. (2011). A Meta-Analysis of Energy Savings from Lighting Controls in Commercial Buildings. Berkeley, CA: Lawrence Berkeley National Laboratory.
6. Measure Life for automatically controlled measures from the Deemed Savings for CO Energy Management Systems, 2019-2020. (NLC Measure Life)
7. Design Lights Consortium (2018). Qualified Products List as of February 27, 2018. (Lamp Lifetime Hours)
8. Hours of Use to calculate measure life for lamps was determined using a weighted hours of operation from Xcel Energy 2018/2019 participation.
9. LED baseline and proposed costs come from previous Xcel Energy Custom Lighting Efficiency projects, as well as market research through ShineRetrofits.com, LightingAtlanta.org,
10. "Lighting Efficiency - MN" and "Lighting - Small Business" participation data from 2016 through 2018.
11. Deemed Savings for 2021-2023 "Product: Lighting Efficiency - MN" to reference deemed values used to create weighted averages for HVAC Interactive Factors, Hours and CF.
12. Energy Independence and Security Act. United States Congress. Jan 4, 2007. http://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/eisa_2007.pdf
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15. ENERGY STAR ® Integral LED Product Qualifications Requirements. 2010.
16. Caliper Benchmark Report - Performance of Halogen Incandescent MR 16 Lamps and LED Replacements. U.S. Department of Energy. November, 2008.
17. Incandescent Reflector Lamps minimum efficacy standards. http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/58
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23. Power Factor.https://assets.osram-americas.com/assets/documents/FAQ0056-0605.8d13d344-4cd2-42f2-af91-100b2a1a8a4d.pdf

Changes from Recent Filing:

Table 13.1.0: HVAC Interactive Factors [1, 2]

HVAC_Type	Cooling_kWh_ Savings_Factor	Cooling_kW_ Savings_Factor	Heating_Penalty_ Factor (Dth/kWh)
Heating Only	1.00	1.00	-0.000683
Heating and Cooling	1.11	1.33	-0.000683
Cooler Door Retrofit to LED	1.44	1.44	0.00
Freezer Door Retrofit to LED	1.70	1.70	0.00

Table 13.2.0: Measure Lifetimes in Years [6, 7, 8]

Measure	Lifetime
LED Fixtures, Retrofit Kits and LED Linear Lamps - Type C	20.0
Lighting Sensors	8.0
Networked Lighting Controls	15.0
LED Linear Lamps - Type A	9.8
LED Linear Lamps - Type B	9.8
LED PL/G based CFL Replacement lamp	10.7
LED Screw-in Lamps, HID Replacement	7.8

Table 13.3.0: Coincident Peak Demand Factors and Annual Operating Hours by Facility Type [3]

Facility_Type	CF	Annual Operating Hours
24-Hour Facility	100%	8,760
College	81%	3,540
Cooler Door Retrofit to LED	87%	8,760
Elementary School	71%	2,422
Secondary School	58%	4,311
Freezer Door Retrofit to LED	87%	8,760
Grocery/Retail (Greater than 50,000SF)	90%	5,802
Healthcare Office / Outpatient	75%	5,095
Hospital	75%	6,038
Hotel/Motel	21%	3,044
Manufacturing	92%	5,200
Exterior Lighting	0%	4,380
Office	70%	4,439
Other/Misc.	66%	4,576
Restaurant	80%	3,673
Retail	83%	4,719
Safety or Code Required (Including Exit Signs)	100%	8,760
Warehouse	70%	4,746
Company Owned Street Lights	0%	4,140

References:

1. HVAC Interactive Factors developed based on the Rundquist Simplified HVAC Interaction Factor method for Minnesota, ASHRAE Journal -
2. COP values from the Deemed Savings for CO Commercial Refrigeration, 2019-2020. (Cooler and Freezer Door Interactive Factors).
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7. Design Lights Consortium (2018). Qualified Products List as of February 27, 2018. (Lamp Lifetime Hours)
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9. LED baseline and proposed costs come from previous Xcel Energy Custom Lighting Efficiency projects, as well as market research through
10. "Lighting Efficiency - MN" and "Lighting - Small Business" participation data from 2016 through 2018.
11. Deemed Savings for 2021-2023 "Product: Lighting Efficiency - MN" to reference deemed values used to create weighted averages for HVAC
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14. Caliper Benchmark Report - Performance of Incandescent A-Type and Decorative Lamps and LED Replacements. U.S. Department of Energy. November, 2008. http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/a-type_benchmark_11-08.pdf
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23. Power Factor.https://assets.osram-americas.com/assets/documents/FAQ0056-0605.8d13d344-4cd2-42f2-af91-100b2a1a8a4d.pdf

14.1 Motors

Algorithms

$$Customer\ kWh = (HP\ x\ LF\_Motors\ x\ Conversion\ x\ \left(\frac{1}{Standard\_Eff} - \frac{1}{High\_Eff}\right)\ x\ Hrs\ x\ Refrigeration\_Factor)$$

$$Customer\ Coincident\ kW = (HP\ x\ LF\_Motors\ x\ Conversion\ x\ \left(\frac{1}{Standard\_Eff} - \frac{1}{High\_Eff}\right)\ x\ CF\ x\ Refrigeration\_Factor)$$

Variables

Hrs	Table 14.1 and Table 14.3	Annual operational hours per year of the motor. Deemed values are used for hours based on the type and use of the motor. The customer provides the following information on the rebate form: HP, industrial/non-industrial, building type, and compressor/pump/fan/other.
LF_Motors	Table 14.2	Motor load factor as a percentage.[1]
COP	Table 14.4	Coefficient of Performance = Refrigeration/Cooling Capacity (BTU/hr) / Energy Input (BTU/hr)
CF	Table 14.5	Coincidence factor
High_Eff	Table 14.6	Efficiency of high efficiency replacement motor as a percentage. New Enhanced and Upgrade Enhanced are NEMA Premium plus 1%. Upgrade is NEMA Premium. The customer will provide the model and serial number of the motor along with actual nameplate efficiency from the new motor. If the actual efficiency is not provided by the customer, it will be determined from specification sheet.
Standard_Eff	Table 14.6	Efficiency of standard replacement motor as a percentage. New Enhanced is NEMA Premium. Upgrade and Upgrade Enhanced are EPACT. Based on customer provided motor size, speed, and enclosure type.
Conversion	0.746	Conversion from HP to kW
Refrigeration_Factor	1+1/COP	Multiplier to include interactive effects of refrigeration or cooling energy to remove heat from the motor. Reduction in motor energy results in a reduction in refrigeration/cooling energy.
Lifetime Upgrade	15	This is the incremental lifetime of retiring an EPACT motor early[1]
Lifetime Enhanced	20	This is the full lifetime of a motor since this is a new to new comparison[1]

Customer Inputs	**M&V Verified**	
New motor model and serial number	Yes	HP, efficiency, type, and speed can then be looked up in a database
Application of motor	Yes	
Building type	Yes	Where motor is installed for non-industrial motors
Use of motor	Yes	Pump, fan, other
Equipment is installed	Yes	

References:

1. Efficiency Vermont's Technical Reference User Manual, 2004 - Source for operating hours for non-industrial motors (p.15) and source for measure life,
2. Office of Industrial Electric Motor Systems Market Opportunities Assessment : Department of Energy (assessment of 265 Industrial facilities in 1997) - Source for VSD opportunity in the US market along with load factors for fans and pumps along with average savings

Assumptions:

- Each motor is replaced with the same size on a 1 for 1 basis. Motors replaced with different sizes can participate in the Custom Efficiency product.
- Prescriptive rebates are only given for motors put into service, rebates are not given for backup motors.
- Prescriptive rebates are only given to VFD's installed on centrifugal pump or fan applications.
- Rebates do not apply to rewound or repaired motors.

Changes from Recent Filing:

Opening the Enhance efficiency program to all motors that meet that efficiency level. This includes induction, Permanent Magnet, Electronically Commutated,
Combined enhanced upgrade and enhanced motors products into one enhanced motors program.
All rebates for both the upgrade motors and the enhanced motors are cut by 50% from their previous level

14.2 VFDs

Algorithms

$$Customer\ kWh = \frac{HP \times LF_{Motors} \times Conversion \times Hours \times \%\_Savings\_Drives \times Refigeration\_Factor}{Avg\_Motor\_Efficency}$$

$$Customer\ Coincident\ kW = \frac{HP \times LF_{Motors} \times Conversion \times CF \times \%\_Savings\_Drives \times Refigeration\_Factor}{Avg\_Motor\_Efficency}$$

Variables

Hours	Table 14.1 and Table 14.3	Annual operational hours per year of the motor. Deemed values are used for hours based on the type and use of the motor. The customer provides the following information on the rebate form: HP, industrial/non-industrial, building type, and compressor/pump/fan/other.
LF_Motors	Table 14.2	Motor load factor as a percentage.[2]
Refrigeration_factor	Table 14.3	Coefficient of Performance = Refrigeration/Cooling Capacity (BTU/hr) / Energy Input (BTU/hr)
CF	Table 14.5	Coincidence factor
Incremental Cost	Table 14.7	Incremental cost for VFD[3]
Avg_Motor Efficiency	Table 14.8	Efficiency of NEMA premium efficient motor as a percentage. Value is a weighted average by HP based on customer past selections.
% Savings Drives	Table 14.9	Energy Savings Factor by Application
Measure life	15	Years[1]
Conversion	0.746	Conversion from horsepower to kW.

Customer Inputs	**M&V Verified**	
HP	Yes	Rated motor horsepower.
Facility Type	Yes	
Equipment Type	Yes	
Application	Yes	

Assumptions:

- Each VFD is replaced with the same size on a 1 for 1 basis.
- Prescriptive rebates are only given for VFDs put into service, rebates are not given for backup VFDs.
- Prescriptive rebates are only given to VFD's installed on centrifugal pump and fan applications.

References:

1. Efficiency Vermont's Technical Reference User Manual, 2004 - Source for operating hours for non-industrial motors (p.15) and source for measure life, source for load factor

2. Office of Industrial Electric Motor Systems Market Opportunities Assessment : Department of Energy (assessment of 265 Industrial facilities in 1997) - Source for VSD opportunity in the US market along with load factors for fans and pumps along with average savings

3. Costs are derived from customer invoices received through Xcel Energy's prescriptive program.

Changes from Recent Filing:

VFD incremental costs were changed to represent past participation costs.
Updating the motor efficiency to be the average motor efficiency based on the motors Xcel Energy has seen through its motors efficiency programs.

14.3 Refigeration Fans

Algorithms

$$Customer\ kWh = \frac{(ECM_{Baseline\ Fan\ W} - ECM_{Efficient\ Fan\ W})}{1000} x\ Refrigeration_{Factor} x\ ECM_{Hours}$$

$$Customer\ Coincident\ kW = \frac{(ECM_{Baseline\ Fan\ W} - ECM_{Efficient\ Fan\ W})}{1000} x\ Refrigeration_{Factor}\ x\ CF$$

Variables

ECM_Baseline_Fan_Watts	Table 14.3.1	Average input watts for shaded pole or permanent split capacitor motor
ECM_Efficient_Fan_Watts	Table 14.3.1	Average input watts for efficient motor[1]
ECM_Hours	Table 14.3.1	Hours per year (freezer subtracts defrost time)[1]
Incremental Cost	Table 14.3.2	Deemed Incremental Costs
COP	Table 14.4	Coefficient of Performance = Refrigeration/Cooling Capacity (BTU/hr) / Energy Input (BTU/hr)
CF	Table 14.5	Coincidence factor
Refrigeration_Factor	1+1/COP	Multiplier to include interactive effects of refrigeration or cooling energy to remove heat from the motor. Reduction in motor energy results in a reduction in refrigeration/cooling energy.
Lifetime	15	Years

Customer Inputs	**M&V Verified**	
Size of motor	Yes	Watts
Application of motor	Yes	Display Case or Walk-in
Case or Walk-in temperature (Medium Temp or Low Temp)	Yes	Medium Temp or Low Temp
For Walk-in's: Fan diameter (<= 15 inches or >15 inches	Yes	<= 15 inches or >15 inches

Table 14.3.1

Motor Application	ECM_Baseline_Fan_Watts[1]	ECM_Efficient_Fan_Watts[1,2,3]	ECM_Hours[1]
MediumTemp Shaded Pole to PMSM in display case	49.69	15.25	8,672
Low Temp Shaded Pole to PMSM in display case	49.69	15.25	8,672
MediumTemp Shaded Pole to ECM in display case	49.69	16.50	8,672
Low Temp Shaded Pole to ECM in display case	49.69	16.50	8,672
Med Temp Shaded Pole to ECM in Walk-in	95.08	30.88	8,585
Low Temp Shaded Pole to ECM in Walk-in	95.08	30.88	8,585
Med Temp permanent split capcaitor (PSC) to ECM in Walk-in	96.00	47.00	8,585
Low Temp permanent split capcaitor (PSC) to ECM in Walk-in	96.00	47.00	8,585

Table 14.3.2

Motor Application	Equipment[1,2]	Labor[1]	Total
Reach-in PMSM	$75.00	$18.30	$93.30
Walk-in ECM	$226.20	$42.81	$269.01
Reach-in ECM	$122.41	$18.30	$140.71

References:

1. ECM baseline and efficient watts and hours are from monitored data from Custom Efficiency projects
2. ENERGY SAVINGS OF PERMANENT MAGNET SYNCHRONOUS FAN MOTOR ASSEMBLY REFRIGERATED CASE EVAPORATORS, Alternative Energy Systems Consulting, Inc., 2016
3. Q-Sync Motors in Commercial Refrigeration: Preliminary Test Results and Projected Benefits, ORNL/TM-2015/466
4. http://www.deeresources.com/files/DEER2016/download/2010-2012_WO017_Ex_Ante_Measure_Cost_Study_-_Final_Report.pdf

Changes from Recent Filing:

None

14.4 Fan Efficiency (FEI)

Algorithms

$$Customer\ kW = \frac{HP\ \times\ LF \times Conversion}{Avg\_Motor\ Efficiency} \times \left((1 - Control_{Factor}) \times \left(\frac{1}{FEI_{Baseline}} - \frac{1}{FEI}\right)\ + Int\_VFD\_Factor\right)$$

$$Baseline\_Cost = \left(A \times \left(\frac{Fan\_Diameter}{Size\_Factor}\right) + \left(\frac{Fan\_Diameter}{Size\_Factor}\right)^{B}\right) \times (MSP\_Min * Markup\_Base + (MSP\_Base - MSP\_Min) \times Markup\_Increm)$$

$$Proposed\_Cost = (A \times Fan\_Diameter + Fan\_Diameter^{B}) \times (MSP\_Min * Markup\_Base + (MSP\_Prop - MSP\_\_Base) \times Markup\_Increm)$$

$$Incremental\ Cost = Proposed\_Cost - \ Baseline\_Cost + VFD\_Cost$$

$$Customer\ kWh = Customer\ kW \times Hours$$

$$Customer\ Coincident\ \ kW = Customer\ kW \times CF$$

Variables

Control_Factor	Table 14.9	Energy Savings Factor by Application
Int_VFD_Factor	Table 14.9	Energy Savings Factor by Application
Minimum Qualifying FEI	Table 14.4.1	Minimum Qualifying FEI[1,2,3,5]
Measure life	Table 14.4.2	Years. Integrated controls reduce the lifetime by 5 years.
MSP_Min, MSP_Base, MSP_Prop	Table 14.4.3	The factors to determine manufacturers selling price based on type of fan and efficiency level. These values can change based on the FEI of the fan, and must be calculated. These factors relate to the minimum markup (FEI=1), baseline FEI, and actual proposed FEI, respectively. [1]
Markup_Base	Table 14.4.3	Base cost markup occurring during distribution based on fan type from the DOE.[1]
Markup_Increm	Table 14.4.3	Incremental cost markup due to efficiency increase from distributors based on fan type from the DOE. Rounded to three decimal places. [1]
A	18.919	Constant in Manufacturers Production Cost equation from DOE. Rounded to three decimal places.[1]
B	2.105	Constant in Manufacturers Production Cost equation from DOE. Rounded to three decimal places.[1]
Hours	Table 14.1, 14.3	Based on Segment
LF	Table 14.2	Fan Motor Loading Factor
CF	Table 14.5	Coincidence factor
VFD_Cost	Table 14.7	Incremental cost due to integrated VFD, matches VFD prescriptive rebate.
Avg_Motor Efficiency	Table 14.8	Efficiency of NEMA premium efficient motor as a percentage. Value is a weighted average by HP based on customer past selections.
Conversion	0.746	Conversion from horsepower to kW
Size_Factor	110%	The average fan size increase to reach a qualifying FEI value. This was developed through conversations with MN Trade Partners.[2]

Customer Inputs	**M&V Verified**	
HP	Yes	Nominal Fan HP
Fan Diameter	Yes	Fan diameter, in inches
Fan Type	Yes	Fan type, available options are in Table 14.4.3
Fan Control	Yes	Fan control, available options are (constant speed or variable speed)
Integrated VFD	Yes	Yes/No option of if a VFD is integrated into fan.
FEI	Yes	Customer Fan Efficiency Index
Equipment Type	Yes	What is the Application of the fan
Industry Segment	Yes	Available options are in tables 14.1 and 14.3
Selection Screenshot Provided	Yes	Selection nameplate showing provided values[4]

Table 14.4.1 FEI values[1,2,3]

HP Bins	Baseline FEI	Minimum Qualifying FEI
10 HP or Less	1.10	1.12
15 HP to 60 HP	1.20	1.22
75 HP or More	1.25	1.27

Table 14.4.2 Measure Life based on control strategy

Measure Life	Value
Integrated VFD Measure Life	15
Fan-only Measure Life	20

Table 14.4.3 Incremental Cost Factors[1]

Fan Type	Baseline Markup	Incremental Markup	MSP Factor
Axial Cylindrical Housed	1.780	1.460	0.0101*FEI+1.5084
Panel	1.724	1.442	0.283
Centrifugal Housed	1.665	1.394	21.4022*FEI^3+-78.3942*FEI^2+96.0738*FEI+-38.1369
Centrifugal Unhoused	1.699	1.405	0.941
Inline and mixed flow	1.568	1.368	16.5886*FEI^3+-60.7626*FEI^2+74.3786*FEI+-29.0017
Radial	1.433	1.255	1.309
Power Roof Ventilator	1.551	1.361	0.844

References:

1. DOE NODA V3 LCC, Engineering, and NIA Supplemental Documents From FEI Working Group
2. 13,000 MN Fan Selections From Trade Partner
3. CEC Draft Staff Report - Analysis of efficiency Standards and Test Procedures for Commercial and Industrial Fans and Blowers
4. AMCA Standard 208-18
5. 2019 ASHRAE 90.1

Changes from Recent Filing:

New Product

14.5 Well Pump VFDs

Algorithms

$$Customer\ kWh = (Base_{kW} - VFD_{kW}) x\ Well\ Hours$$

$$Customer\ Coincident\ kW = (Base_{kW} - VFD_{kW}) x\ CF$$

$$VFD_{kW} = (VFD_{\mathrm{BHP}} / Avg\_Motor\_Efficiency / \mathrm{VFD_{Eff}}) \times Conversion$$

$$Base_{kW} = (Base_{\mathrm{BHP}} / Avg\_Motor\_Efficiency) \times Conversion$$

$$VFD_{BHP} = \frac{(Flow\ x\ VFD_{Head})}{(Constant\ \ x\ Design_{Pump\ Eff})}$$

$$Base_{BHP} = \frac{(Flow\ x\ Base_{Head})}{(Constant\ x\ Base_{Pump\ Eff})}$$

$$Base_{Pump\ Eff} = -0.40205\ x\ (\%_{Flow})^2 + 1.00876\ x\ \%_{Flow} + 0.20113$$

$$VFD_{Head} = Static_{Head} + Flow_{Coeff}\ x\ (Flow)^2$$

$$Base_{Head} = \%_{Design\ Head}\ x\ Design_{Head}$$

$$Static_{Head} = \%_{Flow} x\ (Max_{Well\ Depth} - Average_{Well\ Depth}) + Average_{Well\ Depth}$$

$$Flow_{Coeff} = Peak\ Dynamic\ head\ x\ (Design_{Flow})^2$$

$$\%_{Design\ Head} = -0.11656\ x\ (\%_{Flow})^2 - 0.34465\ x\ \%_{Flow} + 1.46170$$

$$\%_{Flow} = \frac{Flow}{Design_{Flow}}$$

$$Peak\ Dynamic\ head = Design_{Head} - Max\ Well\ Depth$$

Variables

Well Hours	See 14.5.1	Number of hours per year the well pump will operate. Deemed values are used for hours based on the well pump application that will be provided by the customer.
CF	Table 14.5	Coincidence factor[2]
Avg_Motor Efficiency	Table 14.8	Efficiency of NEMA premium efficient motor as a percentage. Value is a weighted average by HP based on customer past selections.
VFD_Eff	97%	Drive efficiency of a VFD, deemed to be 97% using a table of drive efficiency versus percent of rated power using the motor rated power.[1]
Constant	3960	Pump power equation constant used to convert units of feet of water and gallons per minute to HP.
Base_Pump_Eff	Calculated	Percent efficiency of the water well pump at a given percent of design flow rate. The algorithm is defined above and comes from a linear regression of a second-order polynomial on pump curve data (normalized to design head and flow) from Xcel well pump custom rebate projects.[2]
Design_Pump_Eff	80.8%	Pumping efficiency at given conditions (%_Flow). This algorithm comes from a second-order polynomial curve fit of achievable pump efficiency versus flow rate from custom rebates and their associated pump curves. The design pump efficiency is a constant value used at all flow rates for VFD driven pumps.[2]
Conversion	0.746	HP to kW conversion
%_Design_Head	Calculated	Percent of design total pump head occurring at a given percent of design flow rate. The algorithm is defined above and comes from a linear regression of a second-order polynomial on pump curve data (normalized to design head and flow) from seven Xcel well pump custom rebate projects.[2]
Measure Life	15	Years

Customer Inputs	M&V Verified
Pump Rated HP	Yes
Design Flow (GPM)	Yes
Design Head (ft)	Yes
Well Depth (ft)	No
Max Well Depth at design flow (ft)	No
Average Flow Rate (GPM)	No
Application of well pump (agriculture, golf co	Yes

Table 14.5.1: Operating Hours by Application for Well Pumps[2,3,4,5]

Application	Operating Hours
Agricultural Irrigation	1,954
Golf & Landscape Irrigation	1,941
Municipal Water Supply	3,177
Other Water Well Pump	3,630

References:

1. US DOE Advanced Manufacturing Office Energy Tips, Motor Systems Tip Sheet #11, Adjustable Speed Drive Part-Load Efficiency,
2. Xcel Energy well pump and high static head custom motor rebates
3. Bonneville Power Association, Variable Frequency Drives, http://www.bpa.gov/EE/Sectors/agriculture/Pages/Variable-Frequency-Drives.aspx
4. Department of Energy (DOE) Guidelines for Estimating Unmetered Landscaping Water Use,
5. How Many Acres Are Needed for an 18 Hole Golf Course?, http://golftips.golfsmith.com/many-acres-needed-18-hole-golf-course-1812.html

Changes from Recent Filing:

VFD Costs are changing
Updating the motor efficiency to be the average motor efficiency based on the motors Xcel Energy has seen through its motors efficiency programs.

14.6 Pump Efficiency (PEI)

Algorithms

$$Customer\ kW = \frac{HP\ x\ Conversion \times ADj\_Factor}{Avg\_Motor\_Efficiency} \times ((Baseline\ PEI\ -\ Proposed\ PEI)\ \times (1 - CTRL_{Factor})\ +\ VFD_{Factor})$$

$$Customer\ kWh\ Savings = Customer\ kW\ x\ Hours$$

$$Customer\ Coincident\ kW = Customer\ kW\ x\ CF$$

$$Pump\ Incremental\ Cost = (Cost\ Factor\ m\ x\ (Baseline\ PEI\ -\ Proposed\ PEI) + Cost\ Factor\ b) + VFD\ Cost$$

Variables

Baseline_PEI	Table 14.6.1	Pumps manufactured after 2020 must meet the minimum performance standard for the style and size pump This varies for variable pumps, but is a deemed value of 1 for constant speed pumps.[1]
Adj_Factor	Table 14.6.2	Adjustment Factors are derived from a sample of simulated pump installations, and varies
VFD_{Eff}	Table 14.6.6	Efficiency of the integrated VFD
VFD_{Factor}	Table 14.9	Energy Savings Factor by Application
$CTRL_{Factor}$	Table 14.9	Energy Savings Factor by Application
Hours	Table 14.6.3	Hours of Operation per year or (hr/yr.) Hours are associated with customer provided market segments
Cost Factor m	Table 14.6.4	For constant speed to variable speed applications, use average incremental cost found by NEEA per pump based on hp and PEI.
Cost Factor b	Table 14.6.4	For variable speed to variable speed applications, use average incremental cost found by NEEA per pump based on hp and PEI.. This is the same as the CS_to_CS_Incremental_ Cost as the only change is the pump body.
CF	Table 14.5	Coincidence factor
VFD_Cost	Table 14.7	Incremental cost due to integrated VFD, matches VFD prescriptive rebate.
Avg_Motor Efficiency	Table 14.6	Efficiency of NEMA premium efficient motor as a percentage. Value is a weighted average by HP based on customer past selections.
Conversion	0.746	Conversion from HP to kW
Constant Speed Lifetime	20	Years
Variable Speed Lifetime	15	Years

Customer Inputs	**M&V Verified**	
Proposed_PEI	Yes	Pump efficiency level (PEI), which must be meet the minimum requirements in table below **must be at least .02 PEI below baseline**.
Integrated VFD	Yes	Does the proposed pump have an integrated VFD
Proposed Pump Speed Control	Yes	Identify if the proposed pump speed is constant speed or variable speed.
Horsepower	Yes	Nominal Pump Horsepower as identified on pump motor
Pump Equipment Type	Yes	Equipment Types
Pumping Application	Yes	Check Pumping Application for Commercial HVAC and DHW, Agricultural or Industrial or Municipal
Percent Glycol	No	What percentage Glycol is the system
Pump Class	Yes	Identify type of pump and class

Table 14.6.1 Minimum PEI values

DOE Product Category	1-5 HP	7.5+ HP
All Constant Speed Pumps	1.00	1.00
Non-VT Variable Speed Pumps	0.54	0.50
VT Variable Speed Pumps	0.63	0.60

Table 14.6.2: Adjustment Factors for Pumps[4]

Pump Type	Variable Speed Pumps			Constant Flow Pumps (All Segments)
	Agricultural Irrigation	Industrial and Municipal	Commercial HVAC and DHW	
Non-Vertical Turbine Pump	1.13	1.13	1.22	0.85
Vertical Turbine Pump	1.50	1.50	1.60	1.15

Note: Commercial HVAC is assumed to have pumps with 40% BEP minimum. Agricultural and Industrial/Municipal are assumed to have 20% BEP minimum.
Source CIP_FR_LCC_2015-09-21_VL_VL_LoadFactor_v2.xlsm, taken and simplified from "lookups" tab and is calculated in excel file "ComIndAgPumps_1_1" on tab "Adj Factors"

Table 14.6.3: Pumping Application Data[3]

Application	Agricultural Irrigation	Industrial and Municipal	Commercial HVAC and DHW
Operating Hours (hrs/yr)	2,400	4,000	5,000

Source for hours
DOE, pump subcommittee
Northwest motor database pumping applications, pump subcommittee
Green Motor Rewind UES measure workbook

Table 14.6.4: Pump Cost factors[5]

Incremental Costs Equation Factors		
HP	Cost Factor m	Cost Factor b
1	2,164.68	-7.4759
1.5	2,475.70	-8.3028
2	2,723.12	-8.9389
3	3,114.36	-9.9095
5	3,688.25	-11.2651
7.5	4,218.13	-12.4541
10	4,639.64	-13.3620
15	5,306.17	-14.7368
20	5,836.38	-15.7824
25	6,283.85	-16.6348
30	6,674.80	-17.3586
40	7,341.73	-18.5514
50	7,904.60	-19.5199
60	8,396.37	-20.3395
75	9,040.06	-21.3773
100	9,943.27	-22.7713
125	10,705.54	-23.8955
150	11,371.53	-24.8413
200	11,966.83	-25.6596

Source: These were calculated using the forecast incr. cost tab. Each pump PEI level was individually set at 100% with the other levels at 0%.

Table 14.6.5: Pump Types Considered

Type	HP Range
End Suction Frame Mount (ESFM)	1-200 HP
End Suction Close Coupled (ESCC)	1-200 HP
In-Line (IL)	1-200 HP
Radially Split multi-stage vertical in-line diffuser casing (RSV)	1-200 HP
Vertical Turbine Submersible (ST)	1-200 HP

Table 14.6.6: Integrated VFD Efficiencies

VFD Efficiency	Value
No VFD	100%
Yes VFD	97%

References:

1: DOE pump equipment classes and nominal speed, defined in the Rulemaking
http://www.pumps.org/DOE_Pumps.aspx

2: These values were derived in CIP_FR_LCC_2015-09-21_CL_baselinePEI.xlsm as an estimate of the current market average efficiency level. This is based on the Table 8.3.4

3: Irrigation hours are taken from metering shown in the Green Motors Rewind UES workbook
Industrial hours are the average hours for pump applications in the NW Motor Database
Commercial water circulation hours are from the Circulator Pump Working Group
Municipal hours are based on assumed hours close to 8760 with redundant pumps
Other hours are from the DOE LCC calculator, combined with RTF pump subcommittee judgment

4: Work product is included a Utility titled "ComIndAgPumps_1_1" based upon CIP_FR_LCC_2015-09-21_CL_CL_LoadFactor.xlsm

5: Work product from utility work paper based upon CIP_FR_LCC_2015-09-21_Costs.xlsm

6: Supplyhouse.com shows variable speed 1 HP circulator pumps from $1400-$3100; non variable speed are under $1000, some data available at the following website
http://www.supplyhouse.com/Grundfos-Pumps-1838000

7: Pump Energy Index (PEI) based upon the Regional Technical Forum (RTF) approved Northwest Energy Efficiency Alliance (NEEA) pump ECS savings analysis from the Efficient Commercial and Industrial Pumps (ECIP) project, the Federal Standard is under Title 10 Section 431.462 for the Department of Energy (DOE) Energy Conservation Standard (ECS) for commercial, industrial and agricultural clean water pumps.

Changes from Recent Filing:

Updated the calculation methodology to be more streamlined.
Updated the offereing to be based on the integration of the VFD rather than on the previous control type and the new control type.
Updating the motor efficiency to be the average motor efficiency based on the motors Xcel Energy has seen through its motors efficiency programs.

14.7 Fractional HP Circ. Pumps

Algorithms

$$Customer\ kWh = (kW_{BASE} - kW_{ECM}) \times Hours$$

$$Customer\ Coincident\ kW = (kW_{BASE} - kW_{ECM}) \times CF$$

$$kW_{ECM} = \frac{ECM_{wattage}}{1000}$$

$$kW_{BASE} = \frac{kW_{ECM}}{Baseline\_Conversion}$$

$$Incrmental\ cost = ECM_{wattage} * Cost\ Factor_M + Cost\ Factor_b$$

Variables

Hours	Table 14.7.1	Annual operational hours per year of the motor. Deemed values are used for hours based on the type and use of the motor.
CF	Table 14.7.1	Deemed Coincident Factor
Incremental Cost	14.7.2	$/Nameplate Watt[1]
Conversion	0.746	HP to kW conversion
Baseline_Conversion	0.18	Multiplier to convert the nameplate power of a proposed motor to the to the assumed baseline.
Lifetime	15	The lifetime of an ECM circulator pump

Customer Inputs	**M&V Verified**	
ECM Wattage	Yes	If wattage isnt listed on the nameplate then convert the HP to Watts (ECM HP*746)
Application	Yes	DHW Circulator, Heating Water Circulator, or Cooling Water Circulator

Table 14.7.1 Operating hours and CF by application[1]

Type	Hours	CF
DHW Circulator	2190	100.0%
Heating Water Circulator	2582	0.0%
Cooling Water Circulator	1191	29.9%

Table 14.8.2 Incremental Cost Factor[2]

Cost Factor M	Cost Factor b
$ 0.1851	$ 135.34

Assumptions:

Domestic Hot water pumps are installed with on demand controls

References:

1. MN TRM Version 3.0, "C/I HVAC - ECM Circulators" p. 274
2. Xcel energy research into the cost difference between an ECM and PSC (September 2019)

Changes from Recent Filing:

New Measure

14.8 Fractional HP Fan Motors

Algorithms

$$Customer\ kWh = (CFM\ \times\ Box_{Factor} \times LF \times Hours) / Conversion$$

$$Customer\ Coincident\ kW = (CFM \times Box_{Factor}\ \times\ LF \times CF) / Conversion$$

$$Incrmental\ cost = HP * Cost\ Factor_M + Cost\ Factor_b$$

Variables

LF	90%	Load Factor for Fractional ECM Fans per MN TRM[1]
Box_Factor	Table 14.8.1	The savings factor in w/CFM based[1]
Cost Factor M	Table 14.8.2	Dollars Per HP
Cost Factor b	Table 14.8.2	Dollars
Hours	Table 14.8.3	Operating Hours for Fractional HP ECM Fans based on EFLH per MN TRM[1]
CF	90%	Coincident Factor for Fractional ECM Fans per MN TRM[1]
Conversion	1000	Watts to kW conversion
Lifetime	15	Lifetime of an ECM[1]

Customer Inputs	**M&V Verified**	
ECM HP	Yes	HP or Converted Wattage of ECM
Building Type	Yes	Building area the fan is Serving
CFM	Yes	The rated CFM of the ECM Fan

Table 14.8.1 Box Factor based on CFM[1]

CFM	Watts / CFM
<1000	0.31
>=1000	0.21

Table 14.8.2 Incremental Cost Factor[3]

Cost Factor M	Cost Factor b
$ 138.07	$ 135.34

Table 14.8.3 Fractional ECM Operating Hours[1]

Building Type	Average Hours
Office	2,528
Retail	2,230
Hospitals	3,290
Elementary/Secondary Schools	2,672
Restaurant	2,204
Warehouse	2,002
Hotels/Motels	2,727
Grocery	2,230
Health	2,746
College/University	2,538
Manufacturing	1,736
Other/Miscellaneous	2,519

Assumptions:

- Prescriptive rebates are only given for motors put into service, rebates are not given for backup motors.
- Rebates do not apply to rewound or repaired motors.
- Termainal ECM Fan Operating Hours are lower due to direct correlation to heating and cooling energy use.

References:

1. MN TRM Version 3.0, "C/I HVAC - ECM Fans" p. 274
2. IECC 2018
3. Xcel energy research into the cost difference between an ECM and PSC (September 2019)

Changes from Recent Filing:

New Measure

Table 14.1: Operating Hours by Motor Size, Industrial Applications[3]

HP	Fans	Pumps	Air Compressor	Other
1	4550	3380	1257	2435
1.5	4550	3380	1257	2435
2	4550	3380	1257	2435
3	4550	3380	1257	2435
5	4550	3380	1257	2435
7.5	4316	4121	2131	2939
10	4316	4121	2131	2939
15	4316	4121	2131	2939
20	4316	4121	2131	2939
25	5101	4889	3528	3488
30	5101	4889	3528	3488
40	5101	4889	3528	3488
50	5101	4889	3528	3488
60	6151	5667	4520	5079
75	6151	5667	4520	5079
100	6151	5667	4520	5079
125	5964	5126	4685	5137
150	5964	5126	4685	5137
200	5964	5126	4685	5137
250	7044	5968	6148	6102
300	7044	5968	6148	6102
350	7044	5968	6148	6102
400	7044	5968	6148	6102
450	7044	5968	6148	6102
500	7044	5968	6148	6102

Table 14.2 Load Factors[3,4,5]

Application	Load Factor
Other	75%
Pump	75%
ECM Fan	90%
Fan	65%

Table 14.3: Operating Hours by Application for all products other than motor controllers, Non-Industrial[1]

Building Type	Pumps	Fans	Other
Office	2000	6192	4500
Retail	2000	3261	4500
Hospitals	2754	8374	4500
Elementary/Secondary Schools	2190	3699	4500
Restaurant	2000	4155	4500
Warehouse	2241	6389	4500
Hotels/Motels	4231	3719	4500
Grocery	2080	6389	4500
Health	2559	2000	4500
College/University	3641	3631	4500
Data Center	8760	8760	0

Table 14.4 COPs for different systems

Application	COP
Low Temperature	1.43
Medium Temperature	2.28
HVAC	3.00
Data Center	4.00

Table 14.5 Coincidence Factors[1,2,4]

Application	CF
Motors	78%
Well Pumps	38%
Pumps	78%
Fans	78%
Display Case Refrigeration Fans	99%
Walk-in Refrigeration Fans	98%

Table 14.6 Efficiencies by Motor Types

Motor Tag	HP	Speed	Type	EPACT Motor Efficiency	NEMA Premium Motor Efficiency	NEMA Premium +1% Motor Efficiency	NEMA Premium Cost	NEMA +1% Cost
1 HP 900 RPM ODP	1	900	ODP	74.0%	75.5%	76.5%	$ 683.54	$ 817.66
1.5 HP 900 RPM ODP	1.5	900	ODP	75.5%	77.0%	78.0%	$ 718.34	$ 866.89
2 HP 900 RPM ODP	2	900	ODP	85.5%	86.5%	87.5%	$ 726.88	$ 878.97
3 HP 900 RPM ODP	3	900	ODP	86.5%	87.5%	88.5%	$ 759.91	$ 925.69
5 HP 900 RPM ODP	5	900	ODP	87.5%	88.5%	89.5%	$ 802.06	$ 985.31
7.5 HP 900 RPM ODP	7.5	900	ODP	88.5%	89.5%	90.5%	$ 996.00	$ 1,259.65
10 HP 900 RPM ODP	10	900	ODP	89.5%	90.2%	91.2%	$ 1,117.02	$ 1,430.85
15 HP 900 RPM ODP	15	900	ODP	89.5%	90.2%	91.2%	$ 2,144.34	$ 2,585.56
20 HP 900 RPM ODP	20	900	ODP	90.2%	91.0%	92.0%	$ 2,369.70	$ 2,904.34
25 HP 900 RPM ODP	25	900	ODP	90.2%	91.0%	92.0%	$ 2,675.38	$ 3,336.74
30 HP 900 RPM ODP	30	900	ODP	91.0%	91.7%	92.7%	$ 2,921.91	$ 3,685.47
40 HP 900 RPM ODP	40	900	ODP	91.0%	91.7%	92.7%	$ 3,403.22	$ 4,366.31
50 HP 900 RPM ODP	50	900	ODP	91.7%	92.4%	93.4%	$ 3,728.24	$ 4,826.07
60 HP 900 RPM ODP	60	900	ODP	92.4%	93.0%	94.0%	$ 4,731.77	$ 6,245.61
75 HP 900 RPM ODP	75	900	ODP	93.6%	94.1%	95.1%	$ 5,507.32	$ 7,342.66
100 HP 900 RPM ODP	100	900	ODP	93.6%	94.1%	95.1%	$ 7,154.13	$ 9,373.68

125 HP 900 RPM ODP	125	900	ODP	93.6%	94.1%	95.1%	$ 8,514.50	$ 11,297.99
150 HP 900 RPM ODP	150	900	ODP	93.6%	94.1%	95.1%	$ 9,729.63	$ 13,016.85
200 HP 900 RPM ODP	200	900	ODP	93.6%	94.1%	95.1%	$ 11,653.55	$ 15,738.32
250 HP 900 RPM ODP	250	900	ODP	94.5%	95.0%	96.0%	$ 13,935.15	$ 18,965.76
300 HP 900 RPM ODP	300	900	ODP	94.5%	95.0%	96.0%	$ 16,722.72	$ 22,908.92
350 HP 900 RPM ODP	350	900	ODP	94.5%	95.0%	96.0%	$ 26,199.40	$ 36,314.14
400 HP 900 RPM ODP	400	900	ODP	94.9%	95.1%	96.1%	$ 29,656.70	$ 41,204.66
450 HP 900 RPM ODP	450	900	ODP	95.3%	95.5%	96.5%	$ 33,407.70	$ 46,510.64
500 HP 900 RPM ODP	500	900	ODP	95.3%	95.5%	96.5%	$ 34,526.40	$ 48,093.09
1 HP 1200 RPM ODP	1	1200	ODP	80.0%	82.5%	83.5%	$ 683.54	$ 817.66
1.5 HP 1200 RPM ODP	1.5	1200	ODP	84.0%	86.5%	87.5%	$ 718.34	$ 866.89
2 HP 1200 RPM ODP	2	1200	ODP	85.5%	87.5%	88.5%	$ 726.88	$ 878.97
3 HP 1200 RPM ODP	3	1200	ODP	86.5%	88.5%	89.5%	$ 759.91	$ 925.69
5 HP 1200 RPM ODP	5	1200	ODP	87.5%	89.5%	90.5%	$ 802.06	$ 985.31
7.5 HP 1200 RPM ODP	7.5	1200	ODP	88.5%	90.2%	91.2%	$ 996.00	$ 1,259.65
10 HP 1200 RPM ODP	10	1200	ODP	90.2%	91.7%	92.7%	$ 1,117.02	$ 1,430.85
15 HP 1200 RPM ODP	15	1200	ODP	90.2%	91.7%	92.7%	$ 2,144.34	$ 2,585.56
20 HP 1200 RPM ODP	20	1200	ODP	91.0%	92.4%	93.4%	$ 2,369.70	$ 2,904.34
25 HP 1200 RPM ODP	25	1200	ODP	91.7%	93.0%	94.0%	$ 2,675.38	$ 3,336.74
30 HP 1200 RPM ODP	30	1200	ODP	92.4%	93.6%	94.6%	$ 2,921.91	$ 3,685.47
40 HP 1200 RPM ODP	40	1200	ODP	93.0%	94.1%	95.1%	$ 3,403.22	$ 4,366.31
50 HP 1200 RPM ODP	50	1200	ODP	93.0%	94.1%	95.1%	$ 3,728.24	$ 4,826.07
60 HP 1200 RPM ODP	60	1200	ODP	93.6%	94.5%	95.5%	$ 4,731.77	$ 6,245.61
75 HP 1200 RPM ODP	75	1200	ODP	93.6%	94.5%	95.5%	$ 5,507.32	$ 7,342.66
100 HP 1200 RPM ODP	100	1200	ODP	94.1%	95.0%	96.0%	$ 7,154.13	$ 9,373.68
125 HP 1200 RPM ODP	125	1200	ODP	94.1%	95.0%	96.0%	$ 8,514.50	$ 11,297.99
150 HP 1200 RPM ODP	150	1200	ODP	94.5%	95.4%	96.4%	$ 9,729.63	$ 13,016.85
200 HP 1200 RPM ODP	200	1200	ODP	94.5%	95.4%	96.4%	$ 11,653.55	$ 15,738.32
250 HP 1200 RPM ODP	250	1200	ODP	95.4%	95.8%	96.8%	$ 13,935.15	$ 18,965.76
300 HP 1200 RPM ODP	300	1200	ODP	95.4%	95.8%	96.8%	$ 16,722.72	$ 22,908.92
350 HP 1200 RPM ODP	350	1200	ODP	95.4%	95.8%	96.8%	$ 26,199.40	$ 36,314.14
400 HP 1200 RPM ODP	400	1200	ODP	95.8%	95.9%	96.9%	$ 29,656.70	$ 41,204.66
450 HP 1200 RPM ODP	450	1200	ODP	96.2%	96.3%	97.3%	$ 33,407.70	$ 46,510.64
500 HP 1200 RPM ODP	500	1200	ODP	96.2%	96.3%	97.3%	$ 34,526.40	$ 48,093.09
1 HP 1800 RPM ODP	1	1800	ODP	82.5%	85.5%	86.5%	$ 683.54	$ 817.66
1.5 HP 1800 RPM ODP	1.5	1800	ODP	84.0%	86.5%	87.5%	$ 718.34	$ 866.89
2 HP 1800 RPM ODP	2	1800	ODP	84.0%	86.5%	87.5%	$ 726.88	$ 878.97
3 HP 1800 RPM ODP	3	1800	ODP	86.5%	89.5%	90.5%	$ 759.91	$ 925.69
5 HP 1800 RPM ODP	5	1800	ODP	87.5%	89.5%	90.5%	$ 802.06	$ 985.31
7.5 HP 1800 RPM ODP	7.5	1800	ODP	88.5%	91.0%	92.0%	$ 996.00	$ 1,259.65
10 HP 1800 RPM ODP	10	1800	ODP	89.5%	91.7%	92.7%	$ 1,117.02	$ 1,430.85
15 HP 1800 RPM ODP	15	1800	ODP	91.0%	93.0%	94.0%	$ 2,144.34	$ 2,585.56
20 HP 1800 RPM ODP	20	1800	ODP	91.0%	93.0%	94.0%	$ 2,369.70	$ 2,904.34
25 HP 1800 RPM ODP	25	1800	ODP	91.7%	93.6%	94.6%	$ 2,675.38	$ 3,336.74
30 HP 1800 RPM ODP	30	1800	ODP	92.4%	94.1%	95.1%	$ 2,921.91	$ 3,685.47
40 HP 1800 RPM ODP	40	1800	ODP	93.0%	94.1%	95.1%	$ 3,403.22	$ 4,366.31
50 HP 1800 RPM ODP	50	1800	ODP	93.0%	94.5%	95.5%	$ 3,728.24	$ 4,826.07
60 HP 1800 RPM ODP	60	1800	ODP	93.6%	95.0%	96.0%	$ 4,731.77	$ 6,245.61
75 HP 1800 RPM ODP	75	1800	ODP	94.1%	95.0%	96.0%	$ 5,507.32	$ 7,342.66
100 HP 1800 RPM ODP	100	1800	ODP	94.1%	95.4%	96.4%	$ 7,154.13	$ 9,373.68
125 HP 1800 RPM ODP	125	1800	ODP	94.5%	95.4%	96.4%	$ 8,514.50	$ 11,297.99
150 HP 1800 RPM ODP	150	1800	ODP	95.0%	95.8%	96.8%	$ 9,729.63	$ 13,016.85
200 HP 1800 RPM ODP	200	1800	ODP	95.0%	95.8%	96.8%	$ 11,653.55	$ 15,738.32
250 HP 1800 RPM ODP	250	1800	ODP	95.4%	95.8%	96.8%	$ 13,935.15	$ 18,965.76
300 HP 1800 RPM ODP	300	1800	ODP	95.4%	95.8%	96.8%	$ 16,722.72	$ 22,908.92
350 HP 1800 RPM ODP	350	1800	ODP	95.4%	95.8%	96.8%	$ 26,199.40	$ 36,314.14
400 HP 1800 RPM ODP	400	1800	ODP	95.4%	95.8%	96.8%	$ 29,656.70	$ 41,204.66
450 HP 1800 RPM ODP	450	1800	ODP	95.8%	96.2%	97.2%	$ 33,407.70	$ 46,510.64
500 HP 1800 RPM ODP	500	1800	ODP	95.8%	96.2%	97.2%	$ 34,526.40	$ 48,093.09
1 HP 3600 RPM ODP	1	3600	ODP	76.3%	77.0%	78.0%	$ 683.54	$ 817.66
1.5 HP 3600 RPM ODP	1.5	3600	ODP	82.5%	84.0%	85.0%	$ 718.34	$ 866.89
2 HP 3600 RPM ODP	2	3600	ODP	84.0%	85.5%	86.5%	$ 726.88	$ 878.97
3 HP 3600 RPM ODP	3	3600	ODP	84.0%	85.5%	86.5%	$ 759.91	$ 925.69
5 HP 3600 RPM ODP	5	3600	ODP	85.5%	86.5%	87.5%	$ 802.06	$ 985.31
7.5 HP 3600 RPM ODP	7.5	3600	ODP	87.5%	88.5%	89.5%	$ 996.00	$ 1,259.65
10 HP 3600 RPM ODP	10	3600	ODP	88.5%	89.5%	90.5%	$ 1,117.02	$ 1,430.85
15 HP 3600 RPM ODP	15	3600	ODP	89.5%	90.2%	91.2%	$ 2,144.34	$ 2,585.56
20 HP 3600 RPM ODP	20	3600	ODP	90.2%	91.0%	92.0%	$ 2,369.70	$ 2,904.34
25 HP 3600 RPM ODP	25	3600	ODP	91.0%	91.7%	92.7%	$ 2,675.38	$ 3,336.74
30 HP 3600 RPM ODP	30	3600	ODP	91.0%	91.7%	92.7%	$ 2,921.91	$ 3,685.47
40 HP 3600 RPM ODP	40	3600	ODP	91.7%	92.4%	93.4%	$ 3,403.22	$ 4,366.31
50 HP 3600 RPM ODP	50	3600	ODP	92.4%	93.0%	94.0%	$ 3,728.24	$ 4,826.07
60 HP 3600 RPM ODP	60	3600	ODP	93.0%	93.6%	94.6%	$ 4,731.77	$ 6,245.61
75 HP 3600 RPM ODP	75	3600	ODP	93.0%	93.6%	94.6%	$ 5,507.32	$ 7,342.66
100 HP 3600 RPM ODP	100	3600	ODP	93.0%	93.6%	94.6%	$ 7,154.13	$ 9,373.68
125 HP 3600 RPM ODP	125	3600	ODP	93.6%	94.1%	95.1%	$ 8,514.50	$ 11,297.99
150 HP 3600 RPM ODP	150	3600	ODP	93.6%	94.1%	95.1%	$ 9,729.63	$ 13,016.85
200 HP 3600 RPM ODP	200	3600	ODP	94.5%	95.0%	96.0%	$ 11,653.55	$ 15,738.32
250 HP 3600 RPM ODP	250	3600	ODP	94.5%	95.0%	96.0%	$ 13,935.15	$ 18,965.76
300 HP 3600 RPM ODP	300	3600	ODP	95.0%	95.4%	96.4%	$ 16,722.72	$ 22,908.92
350 HP 3600 RPM ODP	350	3600	ODP	95.0%	95.4%	96.4%	$ 26,199.40	$ 36,314.14
400 HP 3600 RPM ODP	400	3600	ODP	95.4%	95.8%	96.8%	$ 29,656.70	$ 41,204.66
450 HP 3600 RPM ODP	450	3600	ODP	95.8%	96.2%	97.2%	$ 33,407.70	$ 46,510.64
500 HP 3600 RPM ODP	500	3600	ODP	95.8%	96.2%	97.2%	$ 34,526.40	$ 48,093.09
1 HP 900 RPM TEFC	1	900	TEFC	74.0%	75.5%	76.5%	$ 683.54	$ 817.66
1.5 HP 900 RPM TEFC	1.5	900	TEFC	77.0%	78.5%	79.5%	$ 718.34	$ 866.89
2 HP 900 RPM TEFC	2	900	TEFC	82.5%	84.0%	85.0%	$ 726.88	$ 878.97

3 HP 900 RPM TEFC	3	900	TEFC	84.0%	85.5%	86.5%	$ 759.91	$ 925.69
5 HP 900 RPM TEFC	5	900	TEFC	85.5%	86.5%	87.5%	$ 802.06	$ 985.31
7.5 HP 900 RPM TEFC	7.5	900	TEFC	85.5%	86.5%	87.5%	$ 996.00	$ 1,259.65
10 HP 900 RPM TEFC	10	900	TEFC	88.5%	89.5%	90.5%	$ 1,117.02	$ 1,430.85
15 HP 900 RPM TEFC	15	900	TEFC	88.5%	89.5%	90.5%	$ 2,144.34	$ 2,585.56
20 HP 900 RPM TEFC	20	900	TEFC	89.5%	90.2%	91.2%	$ 2,369.70	$ 2,904.34
25 HP 900 RPM TEFC	25	900	TEFC	89.5%	90.2%	91.2%	$ 2,675.38	$ 3,336.74
30 HP 900 RPM TEFC	30	900	TEFC	91.0%	91.7%	92.7%	$ 2,921.91	$ 3,685.47
40 HP 900 RPM TEFC	40	900	TEFC	91.0%	91.7%	92.7%	$ 3,403.22	$ 4,366.31
50 HP 900 RPM TEFC	50	900	TEFC	91.7%	92.4%	93.4%	$ 3,728.24	$ 4,826.07
60 HP 900 RPM TEFC	60	900	TEFC	91.7%	92.4%	93.4%	$ 4,731.77	$ 6,245.61
75 HP 900 RPM TEFC	75	900	TEFC	93.0%	93.6%	94.6%	$ 5,507.32	$ 7,342.66
100 HP 900 RPM TEFC	100	900	TEFC	93.0%	93.6%	94.6%	$ 7,154.13	$ 9,373.68
125 HP 900 RPM TEFC	125	900	TEFC	93.6%	94.1%	95.1%	$ 8,514.50	$ 11,297.99
150 HP 900 RPM TEFC	150	900	TEFC	93.6%	94.1%	95.1%	$ 9,729.63	$ 13,016.85
200 HP 900 RPM TEFC	200	900	TEFC	94.1%	94.5%	95.5%	$ 11,653.55	$ 15,738.32
250 HP 900 RPM TEFC	250	900	TEFC	94.5%	95.0%	96.0%	$ 13,935.15	$ 18,965.76
300 HP 900 RPM TEFC	300	900	TEFC	95.0%	95.8%	96.8%	$ 16,722.72	$ 22,908.92
350 HP 900 RPM TEFC	350	900	TEFC	95.0%	95.8%	96.8%	$ 26,199.40	$ 36,314.14
400 HP 900 RPM TEFC	400	900	TEFC	95.0%	95.8%	96.8%	$ 29,656.70	$ 41,204.66
450 HP 900 RPM TEFC	450	900	TEFC	95.0%	95.8%	96.8%	$ 33,407.70	$ 46,510.64
500 HP 900 RPM TEFC	500	900	TEFC	95.0%	95.8%	96.8%	$ 34,526.40	$ 48,093.09
1 HP 1200 RPM TEFC	1	1200	TEFC	80.0%	82.5%	83.5%	$ 683.54	$ 817.66
1.5 HP 1200 RPM TEFC	1.5	1200	TEFC	85.5%	87.5%	88.5%	$ 718.34	$ 866.89
2 HP 1200 RPM TEFC	2	1200	TEFC	86.5%	88.5%	89.5%	$ 726.88	$ 878.97
3 HP 1200 RPM TEFC	3	1200	TEFC	87.5%	89.5%	90.5%	$ 759.91	$ 925.69
5 HP 1200 RPM TEFC	5	1200	TEFC	87.5%	89.5%	90.5%	$ 802.06	$ 985.31
7.5 HP 1200 RPM TEFC	7.5	1200	TEFC	89.5%	91.0%	92.0%	$ 996.00	$ 1,259.65
10 HP 1200 RPM TEFC	10	1200	TEFC	89.5%	91.0%	92.0%	$ 1,117.02	$ 1,430.85
15 HP 1200 RPM TEFC	15	1200	TEFC	90.2%	91.7%	92.7%	$ 2,144.34	$ 2,585.56
20 HP 1200 RPM TEFC	20	1200	TEFC	90.2%	91.7%	92.7%	$ 2,369.70	$ 2,904.34
25 HP 1200 RPM TEFC	25	1200	TEFC	91.7%	93.0%	94.0%	$ 2,675.38	$ 3,336.74
30 HP 1200 RPM TEFC	30	1200	TEFC	91.7%	93.0%	94.0%	$ 2,921.91	$ 3,685.47
40 HP 1200 RPM TEFC	40	1200	TEFC	93.0%	94.1%	95.1%	$ 3,403.22	$ 4,366.31
50 HP 1200 RPM TEFC	50	1200	TEFC	93.0%	94.1%	95.1%	$ 3,728.24	$ 4,826.07
60 HP 1200 RPM TEFC	60	1200	TEFC	93.6%	94.5%	95.5%	$ 4,731.77	$ 6,245.61
75 HP 1200 RPM TEFC	75	1200	TEFC	93.6%	94.5%	95.5%	$ 5,507.32	$ 7,342.66
100 HP 1200 RPM TEFC	100	1200	TEFC	94.1%	95.0%	96.0%	$ 7,154.13	$ 9,373.68
125 HP 1200 RPM TEFC	125	1200	TEFC	94.1%	95.0%	96.0%	$ 8,514.50	$ 11,297.99
150 HP 1200 RPM TEFC	150	1200	TEFC	95.0%	95.8%	96.8%	$ 9,729.63	$ 13,016.85
200 HP 1200 RPM TEFC	200	1200	TEFC	95.0%	95.8%	96.8%	$ 11,653.55	$ 15,738.32
250 HP 1200 RPM TEFC	250	1200	TEFC	95.0%	95.8%	96.8%	$ 13,935.15	$ 18,965.76
300 HP 1200 RPM TEFC	300	1200	TEFC	95.0%	95.8%	96.8%	$ 16,722.72	$ 22,908.92
350 HP 1200 RPM TEFC	350	1200	TEFC	95.0%	95.8%	96.8%	$ 26,199.40	$ 36,314.14
400 HP 1200 RPM TEFC	400	1200	TEFC	95.0%	95.8%	96.8%	$ 29,656.70	$ 41,204.66
450 HP 1200 RPM TEFC	450	1200	TEFC	95.0%	95.8%	96.8%	$ 33,407.70	$ 46,510.64
500 HP 1200 RPM TEFC	500	1200	TEFC	95.0%	95.8%	96.8%	$ 34,526.40	$ 48,093.09
1 HP 1800 RPM TEFC	1	1800	TEFC	82.5%	85.5%	86.5%	$ 683.54	$ 817.66
1.5 HP 1800 RPM TEFC	1.5	1800	TEFC	84.0%	86.5%	87.5%	$ 718.34	$ 866.89
2 HP 1800 RPM TEFC	2	1800	TEFC	84.0%	86.5%	87.5%	$ 726.88	$ 878.97
3 HP 1800 RPM TEFC	3	1800	TEFC	87.5%	89.5%	90.5%	$ 759.91	$ 925.69
5 HP 1800 RPM TEFC	5	1800	TEFC	87.5%	89.5%	90.5%	$ 802.06	$ 985.31
7.5 HP 1800 RPM TEFC	7.5	1800	TEFC	89.5%	91.7%	92.7%	$ 996.00	$ 1,259.65
10 HP 1800 RPM TEFC	10	1800	TEFC	89.5%	91.7%	92.7%	$ 1,117.02	$ 1,430.85
15 HP 1800 RPM TEFC	15	1800	TEFC	91.0%	92.4%	93.4%	$ 2,144.34	$ 2,585.56
20 HP 1800 RPM TEFC	20	1800	TEFC	91.0%	93.0%	94.0%	$ 2,369.70	$ 2,904.34
25 HP 1800 RPM TEFC	25	1800	TEFC	92.4%	93.6%	94.6%	$ 2,675.38	$ 3,336.74
30 HP 1800 RPM TEFC	30	1800	TEFC	92.4%	93.6%	94.6%	$ 2,921.91	$ 3,685.47
40 HP 1800 RPM TEFC	40	1800	TEFC	93.0%	94.1%	95.1%	$ 3,403.22	$ 4,366.31
50 HP 1800 RPM TEFC	50	1800	TEFC	93.0%	94.5%	95.5%	$ 3,728.24	$ 4,826.07
60 HP 1800 RPM TEFC	60	1800	TEFC	93.6%	95.0%	96.0%	$ 4,731.77	$ 6,245.61
75 HP 1800 RPM TEFC	75	1800	TEFC	94.1%	95.4%	96.4%	$ 5,507.32	$ 7,342.66
100 HP 1800 RPM TEFC	100	1800	TEFC	94.5%	95.4%	96.4%	$ 7,154.13	$ 9,373.68
125 HP 1800 RPM TEFC	125	1800	TEFC	94.5%	95.4%	96.4%	$ 8,514.50	$ 11,297.99
150 HP 1800 RPM TEFC	150	1800	TEFC	95.0%	95.8%	96.8%	$ 9,729.63	$ 13,016.85
200 HP 1800 RPM TEFC	200	1800	TEFC	95.0%	96.2%	97.2%	$ 11,653.55	$ 15,738.32
250 HP 1800 RPM TEFC	250	1800	TEFC	95.0%	96.2%	97.2%	$ 13,935.15	$ 18,965.76
300 HP 1800 RPM TEFC	300	1800	TEFC	95.4%	96.2%	97.2%	$ 16,722.72	$ 22,908.92
350 HP 1800 RPM TEFC	350	1800	TEFC	95.4%	96.2%	97.2%	$ 26,199.40	$ 36,314.14
400 HP 1800 RPM TEFC	400	1800	TEFC	95.4%	96.2%	97.2%	$ 29,656.70	$ 41,204.66
450 HP 1800 RPM TEFC	450	1800	TEFC	95.4%	96.2%	97.2%	$ 33,407.70	$ 46,510.64
500 HP 1800 RPM TEFC	500	1800	TEFC	95.8%	96.2%	97.2%	$ 34,526.40	$ 48,093.09
1 HP 3600 RPM TEFC	1	3600	TEFC	75.5%	77.0%	78.0%	$ 683.54	$ 817.66
1.5 HP 3600 RPM TEFC	1.5	3600	TEFC	82.5%	84.0%	85.0%	$ 718.34	$ 866.89
2 HP 3600 RPM TEFC	2	3600	TEFC	84.0%	85.5%	86.5%	$ 726.88	$ 878.97
3 HP 3600 RPM TEFC	3	3600	TEFC	85.5%	86.5%	87.5%	$ 759.91	$ 925.69
5 HP 3600 RPM TEFC	5	3600	TEFC	87.5%	88.5%	89.5%	$ 802.06	$ 985.31
7.5 HP 3600 RPM TEFC	7.5	3600	TEFC	88.5%	89.5%	90.5%	$ 996.00	$ 1,259.65
10 HP 3600 RPM TEFC	10	3600	TEFC	89.5%	90.2%	91.2%	$ 1,117.02	$ 1,430.85
15 HP 3600 RPM TEFC	15	3600	TEFC	90.2%	91.0%	92.0%	$ 2,144.34	$ 2,585.56
20 HP 3600 RPM TEFC	20	3600	TEFC	90.2%	91.0%	92.0%	$ 2,369.70	$ 2,904.34
25 HP 3600 RPM TEFC	25	3600	TEFC	91.0%	91.7%	92.7%	$ 2,675.38	$ 3,336.74
30 HP 3600 RPM TEFC	30	3600	TEFC	91.0%	91.7%	92.7%	$ 2,921.91	$ 3,685.47
40 HP 3600 RPM TEFC	40	3600	TEFC	91.7%	92.4%	93.4%	$ 3,403.22	$ 4,366.31
50 HP 3600 RPM TEFC	50	3600	TEFC	92.4%	93.0%	94.0%	$ 3,728.24	$ 4,826.07
60 HP 3600 RPM TEFC	60	3600	TEFC	93.0%	93.6%	94.6%	$ 4,731.77	$ 6,245.61
75 HP 3600 RPM TEFC	75	3600	TEFC	93.0%	93.6%	94.6%	$ 5,507.32	$ 7,342.66

100 HP 3600 RPM TEFC	100	3600	TEFC	93.6%	94.1%	95.1%	$ 7,154.13	$ 9,373.68
125 HP 3600 RPM TEFC	125	3600	TEFC	94.5%	95.0%	96.0%	$ 8,514.50	$ 11,297.99
150 HP 3600 RPM TEFC	150	3600	TEFC	94.5%	95.0%	96.0%	$ 9,729.63	$ 13,016.85
200 HP 3600 RPM TEFC	200	3600	TEFC	95.0%	95.4%	96.4%	$ 11,653.55	$ 15,738.32
250 HP 3600 RPM TEFC	250	3600	TEFC	95.4%	95.8%	96.8%	$ 13,935.15	$ 18,965.76
300 HP 3600 RPM TEFC	300	3600	TEFC	95.4%	95.8%	96.8%	$ 16,722.72	$ 22,908.92
350 HP 3600 RPM TEFC	350	3600	TEFC	95.4%	95.8%	96.8%	$ 26,199.40	$ 36,314.14
400 HP 3600 RPM TEFC	400	3600	TEFC	95.4%	95.8%	96.8%	$ 29,656.70	$ 41,204.66
450 HP 3600 RPM TEFC	450	3600	TEFC	95.4%	95.8%	96.8%	$ 33,407.70	$ 46,510.64
500 HP 3600 RPM TEFC	500	3600	TEFC	95.4%	95.8%	96.8%	$ 34,526.40	$ 48,093.09

Table 14.7 Incremental Costs for VFDs (Derived from customer invoices)

HP	Total Installed Cost
1	$2,182.10
2	$2,493.50
2	$2,741.03
3	$3,132.19
5	$3,705.41
8	$4,234.18
10	$4,654.52
15	$5,318.74
20	$5,846.74
25	$6,292.12
30	$6,681.09
40	$7,344.33
50	$7,903.80
60	$8,392.40
75	$9,031.71
100	$9,928.29
125	$10,684.59
150	$11,345.11
200	$12,471.35

Table 14.8 Average Motor Efficiency (Derived From Past Participation)

HP	EPACT	NEMA	NEMA +1%
1	81.4%	84.1%	85.1%
1.5	83.7%	86.1%	87.1%
2	84.1%	86.4%	87.4%
3	86.5%	88.9%	89.9%
5	87.4%	89.2%	90.2%
7.5	88.7%	90.9%	91.9%
10	89.4%	91.4%	92.4%
15	90.8%	92.4%	93.4%
20	90.9%	92.8%	93.8%
25	91.8%	93.3%	94.3%
30	92.2%	93.5%	94.5%
40	92.8%	93.8%	94.8%
50	92.9%	94.3%	95.3%
60	93.5%	94.6%	95.6%
75	93.9%	95.0%	96.0%
100	94.2%	95.2%	96.2%
125	94.4%	95.3%	96.3%
150	94.9%	95.6%	96.6%
200	94.9%	95.8%	96.8%
250	95.0%	95.8%	96.8%
300	95.4%	95.8%	96.8%
350	95.4%	96.0%	97.0%
400	95.4%	96.2%	97.2%
450	95.6%	96.2%	97.2%
500	95.8%	96.2%	97.2%

Table 14.9 VFD Energy Savings Factors[6]

Application	ESF
Pumps	
Hot Water Pump	0.482
Chiller Water or Condensor Water Pump	0.432
Industrial	0.333
Other	0.333
Fans	
Constant Volume (no flow control)	0.535
Cooling Tower Fan	0.249
Industrial	0.333
Other	0.333

Referneces

1. NYSERDA (New York State Energy Research and Development Authority), Energy $mart Programs Deemed Savings Database - Source for coincidence factor and useful life
2. Xcel Energy well pump and high static head custom motor rebates
3. Office of Industrial Electric Motor Systems Market Opportunities Assessment : Department of Energy (assessment of 265 Industrial facilities in 1997) - Source for VSD opportunity in the US market along with load factors for fans and pumps along with average savings

4. Efficiency Vermont's Technical Reference User Manual, 2004 - Source for operating hours for non-industrial motors (p.15) and source for measure life, source for load factor
5. MN TRM Version 3.0, "C/I HVAC - ECM Fans" p. 274
6. MN TRM Version 2.2, "C/I HVAC - Variable Speed Drives" p.79

15.1 Modeled Residential New Construction

Algorithms

$$Customer\ kWh = kWh_{Reference\ Home} - kWh_{As\ Built\ Home}$$

$$Customer\ kW = \frac{Customer\ kWh}{Hours\ of\ Use}$$

$$Summer\ Peak\ kW = Summer\ Peak\ kW_{Reference\ Home} - Summer\ Peak\ kWAs_{Built\ Home}$$

$$WinterPeak\ kW = Winter\ Peak\ kWReference_{Home} - Winter\ Peak\ kWAs_{Built\ Home}$$

$$Customer\ Coincident\ kW = Customer\ kW \times Coincidence\ Factor$$

$$Customer\ Dth = Dth_{Reference\ Home} - Dth_{As\ Built\ Home}$$

$$\%\ Better\ Than\ Code = \frac{(MMBTU_{Reference\ Home} - MMBTUAs_{Built\ Home})}{MMBTU_{Reference\ Home}}$$

$$MMBTU_{Reference\ Home} = \{(Heating\ kWh_{Reference\ Home} + Cooling\ kWh_{Reference\ Home} + Water\ Heating\ kWh_{Reference\ Home} + Lighting\ and\ Appliance\ kWh_{Reference\ Home}) \times \frac{3,412}{1,000,000}\} + \{(Heating\ th_{Reference\ Home} + Water\ Heating\ th_{Reference\ Home} + Lighting\ and\ Appliance\ th_{Reference\ Home}) \times \frac{1}{10}\}$$

$$MMBTU_{As\ Built\ Home} = \{(Heating\ kWh_{As\ Built\ Home} + Cooling\ kWhAs_{Built\ Home} + Water\ Heating\ kWhAs_{Built\ Home} + Lighting\ and\ Appliance\ kWh_{As\ Built\ Home}) \times \frac{3,412}{1,000,000}\} + \{(Heating\ thAs_{Built\ Home} + Water\ Heating\ thAs_{Built\ Home} + Lighting\ and\ Appliance\ th_{As\ Built\ Home}) \times \frac{1}{10}\}$$

Variables

Coincidence Factor	90%	Deemed concidence factor
Lifetime	20	Deemed lifetime
ICC_ADJ_a	Table 15.1.1	Constants for use in calculating an Incremental Cost / Square Foot of home. The cost curve is derived from information provided by Residential Science Resources estimates and home modeling of the most common measures implemented to improve the envelope performance over local codes (Reference 3)
ICC_ADJ_b	Table 15.1.1	
ICC/SF_a	Table 15.2.1	Constants for use in calculating an adjustment factor to correct the incremental cost for home size. An increase in homes size reduces the cost per square foot for the same set of measures due to economies of scale. This factor is used in conjunction with the As Built ICC SF cost formula (Reference 2).
ICC/SF_b	Table 15.2.1	
ICC/SF_c	Table 15.2.1	

Modeler Inputs	M&V Verified	
As-Built HERS Score	No	As-Built Home's HERS Index Score calculated by the Home Rater using a
Home_Size	No	Total modeled conditioned space of home (sqft)
Summer Peak kW (Reference)	No	Reference home summer demand
Winter Peak kW (Reference)	No	Reference home winter demand
Reference Heating kW	No	Reference home electric heating energy
Reference Cooling kW	No	Reference home electric cooling energy
Reference Water Heating kW	No	Reference home electric water heating energy
Reference Lights & Appliances kW	No	Reference home electric lights & appliance energy
Reference Heating Therms	No	Reference home gas heating energy
Reference Water Heating Therms	No	Reference home gas water heating energy
Reference Lights and Appliances Therms	No	Reference home gas lights & appliance energy
Summer Peak kW (As Built)	No	As-built home summer demand
Winter Peak kW (As Built)	No	As-built home winter demand
As Built Heating kW	No	As-built home electric heating energy
As Built Cooling kW	No	As-built home electric cooling energy
As Built Water Heating kW	No	As-built home electric water heating energy
As Built Lights & Appliances kW	No	As-built home electric lights & appliance energy
As Built Heating Therms	No	As-built home gas heating energy
As Built Water Heating Therms	No	As-built home gas water heating energy
As Built Lights and Appliances Therms	No	As-built home gas lights & appliance energy

Table 15.1.1 Incremental Cost per Square Foot Adjustment Factor Constants

	ICC_ADJ_a	ICC_ADJ_b
IECC 2012	-0.817361291	6.658377406
IECC 2012 - Electric Homes	-0.817361291	6.658377406

Table 15.2.1 Incremental Cost per Square Foot Formula Constants

	ICC/SF_a	ICC/SF_b	ICC/SF_b
IECC 2012	3.0439544984582	4.3783644005126	0.1745156687153
IECC 2012 - Electric Homes	13.6712134574157	3.3698547185842	0.3320586636442

References:

1. California Measurement Advisory Committee (CALMAC) Protocols, Appendix F (www.calmac.org/events/APX_F.pdf).
2. RSR energy savings measure modeling, 2016
3. RSR energy savings measure modeling, 2019

Changes from Recent Filing:

Update on incremental costs (Table 15.1.2)
Added Electric Homes (Tables 15.1.1, 15.1.2)
Update on Lifetime from 20 years to 30 years

16.1 Anti-Sweat Heater Controls

Algorithms

$$Customer\ kW = kW_{Door} \times \left(1 + \left(\frac{Door\ HF}{COP}\right)\right) \times PAF \times Doors\ Controlled$$

$$Customer\ kWh = Customer\ kW \times Hours$$

$$Customer\ Coincident\ kW = Customer\ kW \times Coincidence\ Factor$$

Variables

Doors Controlled	Customer Input	Number of doors being controlled
kW_Door	See Table 16.1.1	Average anti-sweat heater kW per door without controls
Door HF	0.35	Residual Heat fraction; estimated percentage of the heat produced by the heaters that remains in the freezer or cooler case and must be removed by the refrigeration unit. (Reference 24)
PAF	See Table 16.1.1	Percent of time the anti-sweat heaters are turned off by the controller
Hours	See Table 16.1.1	Hours per year
Lifetime	12	Measure Lifetime
Incremental Cost per Ton	See Table 16.1.1	Incremental cost of efficient measures; See Table 1.1.1
Coincidence Factor	See Table 16.1.1	Coincidence Factor (Reference 15)

Customer Inputs	M&V Verified	
Application temperature (medium or low temperature case)	Yes	
Number of doors controlled	Yes	

Table 16.1.1	Eq. kW Door (Reference 24)	Eq. PAF	ASHC Hours	ASH Incremental Cost	Eq. Coincidence Factor
Anti-Sweat Heater - Med Temp	0.105	90%	8,760	$180.00	90%
Anti-Sweat Heater - Low Temp	0.191	90%	8,760	$180.00	90%

References:

15. Monitored data from Custom Efficiency projects
24. SCE Workpaper WPSCNRRN0009, Revision 0, Anti-Sweat Heat (ASH) Controls, October 15, 2007
25. Wisconsin Focus on Energy Anti-Sweat Heater Controls Technical Data Sheet, 2004.
40. State of Wisconsin, Public Service Commission of Wisconsin, Focus on Energy Evaluation, Business Programs Deemed Savings Manual, March 22, 2010.
41. The minimum value calculated on Forecast Weather Data Analysis or Forecast Door Openings
42. Illinois Statewide TRM 2015
43. Efficiency Maine Commercial TRM 2015

Changes from Recent Filing:

No Changes

16.2 No Heat Doors

Algorithms

$$Customer\ kW = (kW_{Baseline} - kW_{Proposed}) \times \left(1 + \left(\frac{Door\ HF}{COP}\right)\right) \times Quantity$$

$$Customer\ kWh = Customer\ kW \times Hours$$

$$Customer\ Coincident\ kW = Customer\ kW \times Coincidence\ Factor$$

Variables

Quantity	Customer Input	Quantity of proposed equipment installed
kW Baseline	See Table 16.2.2	Average kW for a standard case door (Reference 23 and 24)
KW Proposed	See Table 16.2.2	Average kW for a no heat case door (Reference 2)
Door HF	0.35	Estimated percentage of the heat produced by the heaters that remains in the freezer or cooler case and must be removed by the refrigeration unit.
Hours	8,760	Hours per year for no heat case doors (Reference 2)
Lifetime	12.00	Measure Lifetime (Reference 44)
NHD Incremental Cost	See Table 16.2.2	Incremental cost per door
Coincidence Factor	100%	Equipment coincidence factor

Customer Inputs	**M&V Verified**	
Application temperature (medium or low temperature case)	Yes	
Quantity (# of doors)	Yes	

Table 16.2.2	**kW Baseline**	**kW Proposed**	**NHD Incremental Cost**
No Heat Case Door - Medium Temp.	0.105	0.000	$275.00
No Heat Case Door - Low Temp.	0.191	0.000	$800.00

References:

2. PSC of Wisconsin, Focus on Energy Evaluation, Business Programs: Deemed Savings Manual V1.0
20. Energy Savings Potential and R&D Opportunities for Commercial Refrigeration, Final Report; Submitted to: U.S. Department of Energy, Energy Efficiency and Renewable Energy Building Technologies Program; Navigant Consulting, Inc.; September 23, 2009
23. Pennsylvania PUC Technical Reference Manual, June 2012
24. SCE Workpaper WPSCNRRN0009, Revision 0, Anti-Sweat Heat (ASH) Controls, October 15, 2007
44. California Energy Commission and California Public Utilities Commission. Database for Efficient Resources (DEER) 2008, Effective/Remaining Useful Life Values.

Changes from Recent Filing:

Revised Lifetime from 10 to 12 years to match MN TRM reference

16.3 Evaporator Fan Motor Controls

Algorithms

$$Customer\ kW = (kW_{Baseline} - kW_{Proposed}) \times \left(1 + \left(\frac{Heat\ Fraction}{COP}\right)\right) \times Quantity$$

$$Customer\ kWh = Customer\ kW \times Hours$$

$$Customer\ Coincident\ kW = Customer\ kW \times Coincidence\ Factor$$

Variables

Quantity	Customer Input	Quantity of proposed equipment installed
Speed Reduction	25%	New speed as a percent of full speed (Reference 15)
kW Baseline	0.09696	Average input power for shaded pole motor (Reference 15)
kW Proposed	0.00303	Average input power for shaded pole motor at new speed using fan affinity laws and power exponent of 2.5
Heat Fraction	1.00	Estimated percentage of the heat produced by the heaters that remains in the freezer or cooler case and must be removed by the refrigeration unit.
Hours	See Table 16.3.3	Annual hours at reduced speed for medium and low temperature applications
Lifetime	15.00	Measure Lifetime (Reference 20)
Incremental Cost	$351.49	Incremental cost of efficient measures (Reference 21)
Coincidence Factor	See Table 16.3.3	Coincidence factor for medium and low temperature applications

Customer Inputs

	M&V Verified	
Application temperature (medium or low temperature walk-in)	Yes	
Quantity (# of motors controlled)	Yes	

Table 16.3.3	Load Factor	Hours	Coincidence Factor
EFMC - Medium Temp.	62%	3,329	38%
EFMC - Low Temp.	80%	1,717	20%

References:

2. PSC of Wisconsin, Focus on Energy Evaluation, Business Programs: Deemed Savings Manual V1.0, p.4-103 to 4-106.
15. Monitored data from Custom Efficiency projects
20. Energy Savings Potential and R&D Opportunities for Commercial Refrigeration, Final Report; Submitted to: U.S. Department of Energy, Energy Efficiency and Renewable Energy Building Technologies Program; Navigant Consulting, Inc.; September 23, 2011
21. http://www.deeresources.com/files/DEER2016/download/2010-2012_WO017_Ex_Ante_Measure_Cost_Study_-_Final_Report.pdf

Changes from Recent Filing:

No Changes

16.4 Medium Temperature Reach-in Case

Algorithms

$$Customer\ kW = Savings\ Factor \times (Load_{Baseline} - Load_{Proposed}) \times Load\ Factor \times \left(\left(\frac{1}{COP}\right)/3412\right) \times Linear\ Feet$$

$$Customer\ kWh = Customer\ kW \times Hours$$

$$Customer\ Coincident\ kW = Customer\ kW \times Coincidence\ Factor$$

Variables

Linear Feet	Customer Input	Proposed linear feet of equipment installed
Savings Factor	1.00	Amount of time doors are active
TDA	5.5	Total Display area per linear foot. Assumed to be 5.5 square feet based on a 5.5 foot tall glass door.
Baseline Load	1,652	Btuh/ft load of the standard efficiency refrigerated case (Reference 38)
Proposed Load	262	Btuh/ft load of the high efficiency refrigerated case. (Reference 5)
Load Factor	62.0%	Duty cycle of compressor for Medium Temperature
Hours	8,760	Equipment hours per year
Lifetime	15.00	Measure Lifetime
Incremental Cost	See Table 16.4.4	Incremental cost per linear feet of efficient measure (Reference 21).
Coincidence Factor	100%	Equipment coincidence factor

Customer Inputs	**M&V Verified**	
Application temperature (medium temperature)	Yes	
Linear feet installed	Yes	

Table 16.4.4 Incremental Cost

Retrofit Medium Temp. Case (Ref. 21)	$686.29
New Medium Temp. Case (Ref. 45)	$337.58

References:

2. PSC of Wisconsin, Focus on Energy Evaluation, Business Programs: Deemed Savings Manual V1.0, p. 4-103 to 4-106.
3. NREL/TP-550-46101 "Grocery Store 50% Energy Savings Technical Support Document" September 2010
5. Average of multiple vendor products
21. http://www.deeresources.com/files/DEER2016/download/2010-2012_WO017_Ex_Ante_Measure_Cost_Study_-_Final_Report.pdf
38. 2015 International Energy Conservation Code (IECC)
45. Custom Project History of Medium Temperature Cases

Changes from Recent Filing:

Adding New Medium Temperature measure with incremental cost comparing to less-efficient option.

16.5 Close The Case

Algorithms

$$kWh\ Open = (Load \times FI\ Open) \times Load\ Factor \times \left(\frac{\left(\frac{1}{COP}\right)}{3412}\right) \times RefHours - HVAC\ kWh\ Open$$

$$kWh\ Closed = (Load \times FI\ Closed) \times Load\ Factor \times \left(\frac{\left(\frac{1}{COP}\right)}{3412}\right) \times RefHours - HVAC\ kWh\ Closed$$

$$HVAC\ kWh\ Open = (Load \times FI\ Open) \times \left(\frac{\left(\frac{1}{COP}\right)}{3412}\right) \times Cooling\ Hours \times Cooling\ Duty\ Cycle$$

$$HVAC\ kWh\ Closed = (Load \times FI\ Closed) \times \left(\frac{\left(\frac{1}{COP}\right)}{3412}\right) \times Cooling\ Hours \times Cooling\ Duty\ Cycle$$

$$Customer\ Dth = (Load \times (FI\ Closed - FI\ Open)) \times \left(\frac{\left(\frac{1}{COP}\right)}{3412}\right) \times Heating\ Hours \times 1/1000000 \times \frac{1}{Heating\ Eff}$$

$$Customer\ kWh = (kWh\ Open - kWh\ Closed) \times LinearFeet$$

$$Customer\ kW = \frac{Customer\ kWh}{Ref\ Hours}$$

$$Customer\ Coincident\ kW\ =\ Customer\ kW\ \times\ Coincidence\ Factor$$

Variables

Linear Feet	Customer Input	Proposed linear feet of equipment installed
Load	See Table 16.5.5	Total refrigeration load per linear foot for Medium and Low Temp. Cases
FI Open	See Table 16.5.5	Fraction of Refrigerated Case Load that is infiltration for open cases
FI Closed	See Table 16.5.5	Fraction of Refrigerated Case Load that is infiltration for closed cases
FCR	13%	Fraction of Refrigerated Case Load that is conduction and radiation (Ref 33)
Cooling Hours	2908	Number of hours per year that facility is in cooling mode, assuming facility balance point of 60 F
Cooling Duty Cycle	70%	Cooling compressor duty cycle
COP hvac	3.2	Coefficient of Performance for facility HVAC system, from Ref 33. This assumes a DX rooftop unit or similar
Heating Hours	5155	Number of hours per year that facility is in heating mode, assuming facility balance point of 60 F, with a 5 degree economizing dead band before heating starts at 55 F
Heating Eff	78%	Efficiency of heating system from (Ref. 33)
Lifetime	12.00	Measure Lifetime (Ref 11)
Incremental Cost	$497.82	Incremental cost of efficient measures per linear foot (Ref 34) The incremental cost is split by avoided revenue requirements between gas and electric cost.
Coincidence Factor	100%	Coincidence Factor, based on 8,760 hour run time per year

Customer Inputs	**M&V Verified**	
Application temperature (medium or low temperature)	Yes	
Linear feet installed	Yes	

Table 16.5.5	**Load (Btu/hr/ft)**	**FI Open**	**FI Closed**
Medium Temp. Cases	1500	81.77%	13.77%
Low Temp. Cases	1850	82.76%	14.76%

References:

11. 2008 Database for Energy-Efficient Resources, EUL/RUL (Effective/Remaining Useful Life) Values.
21. http://www.deeresources.com/files/DEER2016/download/2010-2012_WO017_Ex_Ante_Measure_Cost_Study_-_Final_Report.pdf
26. Energy Use of Doored and Open Vertical Refrigerated Display Cases, Fricke and Becker; Presented at 2010 International Refrigeration and Air Conditioning Conference
27. Infiltration Modeling Guidelines for Commercial Building Energy Analysis, US Department of Energy Sept 2009
29. HVAC Interactive Factors developed based on the Rundquist Simplified HVAC Interaction Factor method for Minnesota, presented on page 28 of the 11/93 issue of the ASHRAE Journal - "Calculating lighting and HVAC interactions".
33. Wisconsin Focus on Energy Technical Reference Manual 2015, pg. 238-241
34. Costs calculated and derived from four open-to-closed refrigerated case custom rebate projects.
35. Work Paper PECIREF_PGE604 Vertical Refrigerated Case, Medium Temperature: Open to Closed (Retrofit)

Changes from Recent Filing:

No Changes

16.6 Walk-in Freezer Defrost Controls

Algorithms

$$Customer\ kWh = ((Baseline\ Duration/(60 \times Baseline\ Interval)) - (Proposed\ Duration/(60 \times Proposed\ Interval))) \times Defrost\ Wattage \times Hours \times (1 + 1/COPFreezer)$$

$$Customer\ Coincident\ kW = (Customer\ kWh \times Coincidence\ Factor)/Hours$$

Variables

Hours	8760	Annual operating hours of refrigeration system
Baseline Interval	6.0	Baseline hours between defrost cycles (Ref. 46)
Proposed Interval	24.0	Proposed hours between defrost cycles (Ref. 46)
Baseline Duration	40.0	Baseline defrost duration with timer control (Ref. 46)
Proposed Duration	27.0	Proposed defrost duration with demand controls (Ref. 46)
Lifetime	15	Assumed lifetime for commercial controls
Incremental Cost	$1,351.31	Average cost from Custom projects (Ref. 47)
Coincidence Factor	100%	Savings coincidence with summer hours 2pm-6pm

Customer Inputs	**M&V Verified**	
Defrost Wattage	Yes	Defrost coil wattage being controlled

References:

46. Energy Analysis of KE2 Controllers for Walk-in Freezers; Michaels Energy; January 20, 2015
47. Custom project history of Defrost Controls

Changes from Recent Filing:

New Product

16.7 Floating Head Pressure Controls

Algorithms

$$Avg\ LT\ kW\ = LT\ Tons\ \times LT\ \%Load \times (LT\ Eff\ Baseline\ -\ \text{LT Eff Proposed})$$

$$Avg\ MT\ kW\ =\ MT\ Tons\ \times MT\ \%Load \times (MT\ Eff\ Baseline\ -\ \text{MT Eff Proposed})$$

$$Customer\ kW\ =\ Avg\ LT\ kW + Avg\ MT\ kW$$

$$Customer\ kWh\ =\ (Avg\ LT\ kW + Avg\ MT\ kW) \times \text{Hours}$$

$$Customer\ Coincident\ kW\ = Customer\ kW\ \times Coincidence\ Factor$$

Variables

Hours	8760	Annual operating hours of refrigeration system
LT %Load	75%	Low Temperature Load Factor (Ref. 48)
MT %Load	50%	Medium Temperature Load Factor (Ref. 48)
LT Eff Baseline	2.19	Low Temperature Baseline Average kW/Ton (Ref. 48)
LT Eff Proposed	1.97	Low Temperature Proposed Average kW/Ton (Ref. 48)
MT Eff Baseline	1.13	Medium Temperature Baseline Average kW/Ton (Ref. 48)
MT Eff Proposed	0.96	Medium Temperature Proposed Average kW/Ton (Ref. 48)
Lifetime	15	Assumed lifetime for commercial controls
Incremental Cost	$4,185.00	Average cost from completed Custom projects (Ref. 49)
Coincidence Factor	0%	Savings coincidence with summer hours 2pm-6pm

Customer Inputs	**M&V Verified**	
LT Tons	Yes	Design evaporator load on low temperature racks
MT Tons	Yes	Design evaporator load on medium temperature racks

References:

48. Custom M&V project energy consumption, operation, and savings on Floating Head Pressure Controls
49. History of Completed Custom project costs for Floating Head Pressure Controls

Changes from Recent Filing:

New Product

Table 16.6.0

COP_{Cooler}	2.28	Medium Temperature COP for Coolers
$COP_{Freezer}$	1.43	Low Temperature COP for Freezers
Annual Hours	8,760	Hours per year of Refrigeration system operation
Door HF	0.35	Door Residual Heat Fraction
Ref Hours	8,760	Annual hours for refrigeration equipment
MT Load Factor	62%	Compressor Duty Cycle - Medium Temp.
LT Load Factor	80%	Compressor Duty Cycle - Low Temp.

References

1. Energy Savings Potential and R&D Opportunities for Commercial Refrigeration, Final Report; Submitted to: U.S. Department of Energy, Energy Efficiency and Renewable Energy Building Technologies Program; Navigant Consulting, Inc.; September 23, 2009
2. PSC of Wisconsin, Focus on Energy Evaluation, Business Programs: Deemed Savings Manual V1.0
3. NREL/TP-550-46101 "Grocery Store 50% Energy Savings Technical Support Document" September 2009
4. State of Illinois Energy Efficiency Technical Reference Manual, Page 131. July 18, 2012.
5. Average of multiple vendor products
7. US DOE Building America Program. Building America Analysis Spreadsheet, Standard Benchmark DHW Schedules
8. State of Illinois Energy Efficiency Technical Reference Manual, June 1st, 2012. Pages 109-113.
11. 2008 Database for Energy-Efficient Resources, EUL/RUL (Effective/Remaining Useful Life) Values.
14. Efficiency Vermont Technical Reference User Manual, 2/19/2010.
15. Monitored data from Custom Efficiency projects
16. Northwest Regional Technical Forum
17. Comprehensive Process and Impact Evaluation of the (Xcel Energy) Colorado Motor and Drive Efficiency Program, FINAL, March 28, 2011, TetraTech
18. ECM incremental costs are from Southern California Edison Work Paper WPSCNRRN0011: Evaporator Fan Motors
19. New York Standard Approach for Estimating Energy Savings from Energy Efficiency Measures in Commercial and Industrial Programs, Sept 1, 2009.
20. Energy Savings Potential and R&D Opportunities for Commercial Refrigeration, Final Report; Submitted to: U.S. Department of Energy, Energy Efficiency and Renewable Energy Building Technologies Program; Navigant Consulting, Inc.; September 23, 2009
21. http://www.deeresources.com/files/DEER2016/download/2010-2012_WO017_Ex_Ante_Measure_Cost_Study_-_Final_Report.pdf
22. A Study of Energy Efficient Solutions for Anti-Sweat Heaters. Southern California Edison RTTC. December 1999
23. Pennsylvania PUC Technical Reference Manual, June 2011
24. SCE Workpaper WPSCNRRN0009, Revision 0, Anti-Sweat Heat (ASH) Controls, October 15, 2007
25. Wisconsin Focus on Energy Anti-Sweat Heater Controls Technical Data Sheet, 2004.
26. Energy Use of Doored and Open Vertical Refrigerated Display Cases, Fricke and Becker; Presented at 2010 International Refrigeration
27. Infiltration Modeling Guidelines for Commercial Building Energy Analysis, US Department of Energy Sept 2009
28. Arkansas Deemed Savings Quick Start Program Draft Report Commercial Measures Final Report, Nexant. CF and hours
29. HVAC Interactive Factors developed based on the Rundquist Simplified HVAC Interaction Factor method for Minnesota, presented on page 28 of the 11/93 issue of the ASHRAE Journal - "Calculating lighting and HVAC interactions".
30. Technical Reference User Manual No. 2004-31, Efficiency Vermont, 12/31/04. CF and Hours
31. Deemed Savings Database, Minnesota Office of Energy Security, 2008. CF, Hours, kW, Costs, Measure life
33. Wisconsin Focus on Energy Technical Reference Manual 2015, pg. 238-241
34. Costs calculated and derived from four open-to-closed refrigerated case custom rebate projects.
35. Work Paper PECIREF_PGE604 Vertical Refrigerated Case, Medium Temperature: Open to Closed (Retrofit)
36. ENERGY STAR
38. 2015 International Energy Conservation Code (IECC)
39. State of Illinois Energy Efficiency Technical Reference Manual, Pages 60-63 & Pages 90-97. February 8th, 2017.
40. State of Wisconsin, Public Service Commission of Wisconsin, Focus on Energy Evaluation, Business Programs Deemed Savings Manual, March 22, 2010.
41. The minimum value calculated on Forecast Weather Data Analysis or Forecast Door Openings
42. Illinois Statewide TRM 2015
43. Efficiency Maine Commercial TRM 2015
44. California Energy Commission and California Public Utilities Commission. Database for Efficient Resources (DEER) 2008, Effective/Remaining Useful Life Values.
45. Custom Project History of Medium Temperature Cases
46. Energy Analysis of KE2 Controllers for Walk-in Freezers; Michaels Energy; January 20, 2015
47. Custom project history of Defrost Controls
48. Custom M&V project energy consumption, operation, and savings on Floating Head Pressure Controls
49. History of Completed Custom project costs for Floating Head Pressure Controls

17.1 Res AC

Algorithms

$Customer\ kW\ Savings = Customer\ kW_{EqCooling} + Customer\ kW_{QICooling}$

$Customer\ kWh\ Savings = Customer\ kWh_{EqCooling} + Customer\ kWh_{QICooling}$

$Customer\ Coincident\ kW\ Savings = Customer\ Coincident\ kW_{Equipment} + Customer\ Coincident\ kW_{QI}$

Customer Dth_QI Existing Home = Dth Heat_NoQI Existing Home_Eff - Dth Heat_QI Existing Home_Eff

$EER_{baseline} = iCoef0 * (SEER^2_{baaseline}) + iCoef1 * SEER_{baseline}$

$$Customer\ kW_{EqCooling} = \frac{\frac{Size\_Cool}{12{,}000}}{(1 - Sizing\ Loss)} \times \left(\left(\frac{12}{EER_{baseline}}\right) - \left(\frac{12}{EER_{proposed}}\right)\right)$$

$$Customer\ kW_{QICooling} = \frac{Size\_Cool}{12{,}000} * 12/(EER\_proposed) * \left(\left(\frac{1}{1 - Loss_{NoQI}}\right) - \left(\frac{1}{1 - Loss_{Uncorr}}\right)\right)$$

$$Customer\ kWh_{EqCooling} = \frac{\left(\frac{Size\_Cool}{12{,}000}\right)}{1 - Sizing\ Loss} * EFLH_{cooling} * \left(\left(\frac{12}{SEER_{baseline}}\right) - \left(\frac{12}{SEER_{proposed}}\right)\right)$$

$$Customer\ kWh_{QICooling} = \frac{Size\_Cool}{12{,}000} * EFLH_{cooling} * \frac{12}{SEER_{proposed}} * \left(\left(\frac{1}{1 - Loss_{NoQI}}\right) - \left(\frac{1}{1 - Loss_{Uncorr}}\right)\right)$$

$$Customer\ Coincident\ kW_{equipment} = Coincidence\ Factor * \frac{Size\_Cool}{12{,}000} * \frac{1}{1 - Sizing\ Loss} * \left(\left(\frac{12}{EER_{baseline}}\right) - \left(\frac{12}{EER_{Cooling}}\right)\right)$$

$$Customer\ Coincident\ kW_{QI} = Coincidence\ Factor * \frac{12}{EER_{Cooling}} * \frac{Size\_Cool}{12{,}000} * \left(\left(\frac{1}{1 - Loss_{NoQI}}\right) - \left(\frac{1}{1 - Loss_{Uncorr}}\right)\right)$$

$$Incremental\ Capital\ Cost_{Equipment} = Inc\ Cost\ per\ Ton_{EQ} * \frac{Size\_Cool}{12{,}000}$$

$Incremental\ Capital\ Cost_{QI}\ New\ Home = Inc\ Cost_{QI}$

$$Incremental\ Capital\ Cost_{QI}\ E\ Home = MAX\left(75, Inc\ Cost_{QI} - \frac{Size\_Cool}{12{,}000} * \left(\left(\frac{1}{1 - Sizing\ Loss}\right) - 1\right) * Cost\ per\ Ton_{baseline}\right)$$

AC with Furnace Heating Savings

Customer Dth_QI Existing Home = Dth Heat_NoQI Existing Home_Eff - Dth Heat_QI Existing Home_Eff

*Dth Heat_NoQI Existing Home_Eff = Size_Heat * 1/(1 + Oversize Factor) * (1 - Altitude_Adj_Factor) * EFLH_Heat * 1/(Furnace_Eff * (1 - Loss_DuctLeakage)) / 1,000,000*

*Dth Heat_QI Existing Home_Eff = Size_Heat * 1/(1 + Oversize Factor) * (1 - Altitude_Adj_Factor) * EFLH_Heat * 1 / (Furnace_Eff * (1 - Uncorr_Loss)) / 1,000,000*

*Estimated Furnace Size_Heat = Const_a * Size_Cool + Const_b* *NOTE: only if actual furnace capacity is not available*

Variables

$Inc\ Cost\ per\ Ton\_EQ$	See Table 17.1.1	Deemed Plan A Incremental Capital Cost per Ton, Based On Unit Efficiency (New Construction)
$Cost\ per\ Ton\_baseline$	See Table 17.1.1	Baseline capital cost per ton for equipment
EER baseline	See Table 17.0.3	Baseline EER as calculated for residential equipment from the code required SEER.
SEER baseline	See Table 17.0.3	IECC 2012 identified code minimum SEER
Sizing Loss	See Table 17.0.4	
$Loss\_NoQI$	See Table 17.0.4	
$Loss\_Uncorr$	See Table 17.0.4	
$Inc\ Cost\_QI$	See Table 17.1.2	
Coincidence Factor_EQ	See Table 17.0.3	
Coincidence Factor_QI	See Table 17.0.3	
$iCoef0$	-0.02	AC or ASHP SEER to EER Conversion Coefficient used in polynomial equation shown (Reference 1)
$iCoef1$	1.12	AC or ASHP SEER to EER Conversion Coefficient used in polynomial equation shown (Reference 1)
EFLH cooling	See Table 17.0.1	Effective Full Load Hours for cooling load energy savings
EFLH_Heat	See Table 17.0.1	Effective Full Load Hours for heating load QI energy savings
EFLH_Heating_HP	See Table 17.0.1	Effective Full Load Hours for Heat Pump impacted energy savings
Furnace Eff	95% / 80%	Furnace efficiency based on customer provided Furnace Type; Condensing = 95% and Non-Condensing = 80%
Oversize Factor	See Table 17.5.4	Furnace Oversize factor to account for equipment sizing and safety factors. 30% Per MN TRM.
Const_a	1.13530	polynomial constant used for estimating the size of the furnace associated with a New AC unit in an existing furance system.
Const_b	19625	polynomial constant used for estimating the size of the furnace associated with a New AC unit in an existing furance system.
Lifetime	18	for all AC units (Reference 17)
Minimum Qualifying Efficiency	See Table 17.0.2	

Conversion Factors	See Table 17.0.5	for all conversion factors

Customer Inputs	**M&V Verified**	
Size_Cool	Yes	AHRI cooling size rating of Cooling equipment, AC, ASHP, MSHP
Size_Heat (Furnace)	No	Size of existing furnace associated with new AC in existing homes. This will be provided by the vendor. In the case where the size cannot be determined, the estimated size heat will be used.
Furnace Type	Yes	Condensing or non-Condensing, If Furnace Type is unknown, then Condensing will be used.
Quantity proposed equipment	Yes	
EER proposed	Yes	AHRI certified EER
SEER proposed	Yes	AHRI certified EER
Home Type	No	New or Existing home
County	No	Location of the home for determining weather zones.
Landlord Paid Utility?	No	For Home Energy Savings Program - Half of the incremental cost will be rebated if the landlord pays utilities

Table 17.1.1: Incremental Capital Costs - New Construction (Plan A) - Reference 6

SEER	AC Base Cost per Ton	AC Incremental Cost per Ton
13 SEER	$ 422.85	N/A
14/14.5 SEER	$ 514.98	$ 92.13
15 SEER	$ 607.10	$ 184.25
16 SEER	$ 699.23	$ 276.38
17/18+ SEER	$ 791.36	$ 368.51

Table 17.1.2: Incremental Capital Costs - Quality Install (Reference 6)

P_MC_QI_Incremental_Cost__c		
Measures	**New Home**	**Existing Home***
Quality Installation	$ 103.56	$ 259.80

References for All Measures:

1. Building America, Research Benchmark Definitions, 2010. (see p. 10) http://www.nrel.gov/docs/fy10osti/47246.pdf
2. ASHRAE, 2019, Applications Handbook, Ch. 38, table 4, Comparison of Service Life Estimates
3. DOE Appliance Standards Website, Residential Central Air Conditioners and Heat Pumps. https://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/75
4. Neme, Proctor, Nadel, ACEEE, 1999. Energy Savings Potential From Addressing Residential Air Conditioner and Heat Pump Installation Problems, http://aceee.org/research-report/a992
5. State of Minnesota Technical reference Manual For Energy Conservation Improvement Programs, Version 3.1 https://mn.gov/commerce/industries/energy/utilities/cip/technical-
6 ENERGY STAR Quality Installation standards (ESVI). https://www.energystar.gov/index.cfm?c=hvac_install.hvac_install_index
7. NREL 2011 Measure Guideline Sealing and Insulating Ducts in Existing Homes. http://www.nrel.gov/docs/fy12osti/53494.pdf
8. State of Illinois Technical Reference Manual Version 8, dated 2020
9. For explanation of duct sealing requirements for new homes see "Significant Changes to the 2015 Minnesota Residential Codes (MR 1303, 1309 and 1322)". http://www.ci.minneapolis.mn.us/www/groups/public/@regservices/documents/webcontent/wcms1p-142763.pdf
10. Incremental costs for MSHPs were determined from the NEEP Incremental Cost Study Phase 2 Report
11. MSHP equipment life is from Measure Life Report Residential and Commercial/Industrial Lighting and HVAC Measures; http://library.cee1.org/content/measure-life-report-residential-and-commercialindustrial-lighting-and-hvac-measures
12. For estimated life of GSHP see http://www.energysavers.gov/your_home/space_heating_cooling/index.cfm/mytopic=12640 (indoor components up to 25 years; ground loop =50 years)
13. Costs obtained from "2010-2012 WO017 Ex Ante Measure Cost Study Final Report", by Itron, May 2014. These are used in the DEER 2016 database.
14.For assumptions on losses related to overcharge or undercharge on refrigerant see "Sensitivity Analysis of Installation Faults on Heat Pump Performance", by P. Domanski, et. al., Sept 2014, http://www.acca.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=f02c1f61-4d1d-4a24-971d-cc9ea3e626b2&forceDialog=0
15. ENERGY STAR Connected Thermostat Key Product Criteria, Version 1.0, Rev. Jan 2017 - https://www.energystar.gov/products/heating_cooling/smart_thermostats/key_product_criteria
16. Code of Federal Regulations Title 10: Energy PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS Subpart C—Energy and Water Conservation
17: "Measure Life Report - Residential and Commercial/Industrial Lighting and HVAC Measures", dated June 2007 for The New England State Program Working Group prepared by
18. Assumptions on EC fan operating modes. Center for Energy and Environment Comments to Docket Number EERE-2010-BT-STD-0011-0022, July 27, 2010
19. ECM Furnace Impact Assessment Report https://focusonenergy.com/sites/default/files/emcfurnaceimpactassessment_evaluationreport.pdf
20. Xcel Energy, January 2019. Typical MN Residential Smart Switch Load Relief 2011-2015.
21. Xcel Energy, January 2019. Saver's Switch Control History.
22. Xcel Energy. January 2006. Residential Saver's Switch 2005 Impact Evaluation.
23. http://wpb-radon.com/radon_fan_performance.html33:5032:50A33:50
24. Information from manufacturer and contractors (Radonaway)
25. https://www.radonaway.com/products/radon-fans/rp140-pro.php
26. Energy Information Administration's (EIA) 2009 Residential Energy Consumption Survey (RECS)
27. Bin analysis using RECS data for thermostat operation and typical MN home cooling and heating conditions.
28. Energy Information Administration's (EIA) 2015 Residential Energy Consumption Survey (RECS)

Changes from Recent Filing:

17.2 Res GSHP

Algorithms

$$Customer\ kW\ Savings = Customer\ kW_{EqCooling} + Customer\ kW_{QICooling}$$

$$Customer\ Coincident\ kW\ Savings = Customer\ Coincident\ kW_{Equipment} + Customer\ Coincident\ kW_{QI}$$

AC Cooling with Gas Heat Baseline:

$$Customer\ kWh\ Savings = Customer\ kWh_{EqCooling} + Customer\ kWh_{QICooling} + Customer\ kWh_{EQ}\&_{QIHeating}\ Penalty + Customer\ Furnace\ Fan\ kWh$$

$$Customer\ DTherms\ Savings = Customer\ GSHP\ DTh_{EQ}\&_{QIHeating}$$

AC Cooling with Electric Resistance Heat Baseline:

$$Customer\ kWh\ Savings = Customer\ kWh_{EqCooling} + Customer\ kWh_{QICooling} + Customer\ kWh_{EQHeating} + Customer\ kWh_{QIHeating}$$

$$Customer\ kW_{EqCooling} = \frac{\frac{Full\_Load\_Cool}{12{,}000}}{(1 - Sizing\ Loss)} \times \left(\left(\frac{12}{EER_{baseline}}\right) - \left(\frac{12}{EER_{proposed}}\right)\right)$$

$$Customer\ kW_{QICooling} = \frac{Full\_Load\_Cool}{12{,}000} * 12/(EER\_proposed) * \left(\left(\frac{1}{1 - Loss_{NoQI}}\right) - \left(\frac{1}{1 - Loss_{Uncorr}}\right)\right)$$

$$Customer\ Coincident\ kW_{Equipment} = Coincidence\ Factor * \frac{Full\_Load\_Cool}{12{,}000} * \frac{1}{1 - Sizing\ Loss} * \left(\left(\frac{12}{EER_{baseline}}\right) - \left(\frac{12}{EER_{Cooling}}\right)\right)$$

$$Customer\ Coincident\ kW_{QI} = Coincidence\ Factor * \frac{12}{EER_{Cooling}} * \frac{Full\_Load\_Cool}{12{,}000} * \left(\left(\frac{1}{1 - Loss_{NoQI}}\right) - \left(\frac{1}{1 - Loss_{Uncorr}}\right)\right)$$

$$Customer\ kWh_{EqCooling} = \frac{\left(\frac{Full\_Load\_Cool}{12{,}000}\right)}{1 - Sizing\ Loss} * EFLH_{cooling} * \left(\left(\frac{12}{SEER_{baseline}}\right) - \left(\frac{12}{SEER_{proposed}}\right)\right)$$

$$Customer\ kWh_{QICooling} = \frac{Full\_Load\_Cool}{12{,}000} * EFLH_{cooling} * \frac{12}{SEER_{proposed}} * \left(\left(\frac{1}{1 - Loss_{NoQI}}\right) - \left(\frac{1}{1 - Loss_{Uncorr}}\right)\right)$$

$$Incremental\ Capital\ Cost_{Equipment} = \frac{Size\_Heat}{12{,}000} * (GSHP\_Cost\_per\_Heat\_Ton) - Full_{Load_{Cooling}}/12000 * Base\_AC\_Cost\_per\_Ton - Base\_Furnace\_Cost$$

$$Incremental\ Capital\ Cost_{QI}\ New\ Home = Inc\ Cost_{QI}$$

$$Incremental\ Capital\ Cost_{QI}\ E\ Home = MAX\left(75, Inc\ Cost_{QI} - \frac{Size\_Heat}{12{,}000} * \left(\left(\frac{1}{1 - Sizing\ Loss}\right) - 1\right) * Cost\ per\ Ton_{baseline}\right)$$

$$load\ profile\ slope\ (m) = \frac{(-1 * Size_{Heat} - balance\ pt\ load)}{(Min\ OAT - balance\ pt\ temp)}$$

*load profile y intercept (b) = (-1 * Size_Heat) - (m * Min OAT)*

*Full_Load_Cooling = m * Max OAT + b*

$$Customer\ kWh_{EQ}\&_{QIHeating}\ Penalty = Size\_Heat / (1 - Loss\_uncorr) * EFLH\_Heat * (0 - (1 / (COP\_Eff * 3.412))) / 1000$$

$$Customer\ GSHP\ DTh_{EQ}\&_{QIHeating} = Size\_Heat / (1 - Loss\_No\_QI\_Duct\_Leakage) * EFLH\_Heat * (1 / Baseline\ Gas\ Eff) / 100000$$

$$Customer\ Furnace\ Fan\ kWh = Furnace\_Fan\_kW * EFLH\_Heat$$

$$Customer\ kWh_{EQHeating} = Size\_Heat / (1 - loss\_no\_QI) * EFLH\_Heat * (1 / (COP\_baseline * 3.412) - (1 / (COP\_Eff * 3.412))) / 1000$$

$$Customer\ kWh_{QIHeating} = Size\_Heat * EFLH\_Heat * 1 / (COP_{Eff} * 3.412) * (1 / (1 - loss\_No\_QI) - 1/(Loss\_uncorr)/1000$$

Variables

COP_Baseline	See Table 17.0.3	Baseline COP for Ground Source Heat Pump system with Electric Resistance Baseline Heat
Balance Point Load	0	BTUH - Heating and cooling loads are zero at the balance point outdoor ambient temperature.
Balance Point Temperature	60	Outdoor Ambient Temperature at which residential cooling and heating load profiles equal zero BTUH.
Max OAT	98	Maximum Outdoor Ambient Temperature used in building ASHP load profile; TMY3 basis.
Min OAT	-23	Minimum Outdoor Ambient Temperature for caluclating full load heating; TMY3 Basis.
Furnace Fan kW	0	EC Motor Furnace Fan operating kW for use in baseline fan energy
Baseline Gas Eff	See Table 17.5.3	Efficinecy of the baseline gas furnace based on home type, new or existing
EER_Base	See Table 17.0.3	Efficinecy of the baseline Air Condtioner
EFLH_Cooling	See Table 17.0.1	

EFLH_Heating	See Table 17.0.1	
Sizing Loss	See Table 17.0.4	
$Loss\_NoQI$	See Table 17.0.4	
$Loss\_Uncorr$	See Table 17.0.4	
$Inc\ Cost\_QI$	See Table 17.1.2	
GSHP_Cost_per_Heat_Ton	See Table 17.2.1	Cost per heating ton of a ground source heat pump system including wells
Base_AC_Cost_per_Ton	See Table 17.2.1	
Base_Furnace_Cost	See Table 17.2.1	
Lifetime	20	
Minimum Qualifying Efficiency	See Table 17.0.2	

Customer Inputs	**M&V Verified**	
Size_Heat	Yes	
COP_Eff	Yes	
Size_Cool	Yes	
EER_Eff	Yes	
Home Type	Yes	Existing or New home
Baseline Heat Type	No	For Existing Homes there is a choice of Electric Resistance or Gas Heat. For New Homes the baseline will be Electric Resistance.
County	No	Location of the home for determining weather zones.

Table 17.2.1. Incremental Capital Costs - New Construction (Plan A) - Reference 8

SEER	Base_AC_Cost_per_Ton (Includes Labor)	Base_Furnace_Cost (includes Labor)	GSHP Cost per Heat Ton
GSHP - EXISTING HOME	$ 952.00	$ 2,011.00	$ 3,957.00
GSHP - NEW HOME	$ 952.00	$ 2,239.62	$ 3,957.00

Changes from Recent Filing:

Added Heating savings for GSHP measures.

17.3 Res ASHP

Algorithms

$Customer\ kW\ Savings = Customer\ kW_{EqCooling} + Customer\ kW_{QICooling}$

$Customer\ Coincident\ kW\ Savings = Customer\ Coincident\ kW_{Equipment} + Customer\ Coincident\ kW_{QI}$

ASHP Baseline Cooling Only:

$Customer\ kWh\ Savings = Customer\ kWh_{EqCooling} + Customer\ kWh_{QICooling}$

Electric Resistance Baseline:

$Customer\ kWh\ Savings = Customer\ kWh_{EqCooling} + Customer\ kWh_{QICooling} + Customer\ kWh_{EQHeating} + Customer\ kWh_{QIHeating}$

$EER_{baseline} = iCoef0 * (SEER^2_{baaseline}) + iCoef1 * SEER_{baseline}$

$$Customer\ kW_{EqCooling} = \frac{\frac{Size\_Cool}{12{,}000}}{(1 - Sizing\ Loss)} \times \left(\left(\frac{12}{EER_{baseline}}\right) - \left(\frac{12}{EER_{proposed}}\right)\right)$$

$$Customer\ kW_{QICooling} = \frac{Size\_Cool}{12{,}000} * 12/(EER\_proposed\ ) * ((\frac{1}{1 - Loss_{NoQI}}) - \left(\frac{1}{1 - Loss_{Uncorr}}\right))$$

$$Customer\ Coincident\ kW_{equipment} = Coincidence\ Factor * \frac{Size\_Cool}{12{,}000} * \frac{1}{1 - Sizing\ Loss} * (\left(\frac{12}{EER_{baseline}}\right) - \left(\frac{12}{EER_{Cooling}}\right))$$

$$Customer\ Coincident\ kW_{QI} = Coincidence\ Factor * \frac{12}{EER_{Cooling}} * \frac{Size\_Cool}{12{,}000} * ((\frac{1}{1 - Loss_{NoQI}}) - \left(\frac{1}{1 - Loss_{Uncorr}}\right))$$

$$Customer\ kWh_{EqCooling} = \frac{\left(\frac{Size\_Cool}{12{,}000}\right)}{1 - Sizing\ Loss} * EFLH_{cooling} * ((\frac{12}{SEER_{baseline}}) - \left(\frac{12}{SEER_{proposed}}\right))$$

$$Customer\ kWh_{QICooling} = \frac{Size\_Cool}{12{,}000} * EFLH_{cooling} * \frac{12}{SEER_{proposed}} * ((\frac{1}{1 - Loss_{NoQI}}) - \left(\frac{1}{1 - Loss_{Uncorr}}\right))$$

$$Incremental\ Capital\ Cost_{Equipment} = Inc\ Cost\ per\ Ton_{EQ} * \frac{Size\_Cool}{12{,}000}$$

$Incremental\ Capital\ Cost_{QI}\ New\ Home = Inc\ Cost_{QI}$

$$Incremental\ Capital\ Cost_{QI}\ E\ Home = MAX(75, Inc\ Cost_{QI} - \frac{Size\_Cool}{12{,}000} * (\left(\frac{1}{1 - Sizing\ Loss}\right) - 1) * Cost\ per\ Ton_{baseline}))$$

ASHP Heating Energy Savings

m_load_profile = (balance pt load - Size_Cool) / (balance pt temp - Max OAT)

*b_load_profile = Size_Cool - (m_load_profile * Max OAT)*

*Full Load Heat = m_load_profile * Min OAT + b_load_profile*

Electric Resistance Heat Baseline:

$Customer\ kWh_{EQHeating}$ *= -1 * Full_Load_Heat * EFLH_Heating_HP * (1 / (HSPF_Baseline) - 1 / (HSPF_Proposed * HSPF_Adj_Factor)) / 1000*

$Customer\ kWh_{QIHeating}$ *= -1 * Full_Load_Heat * EFLH_Heating_HP * 1 / (HSPF_Proposed * HSPF_Adj_Factor) * (1 / (1- loss_No_QI) - 1/Loss_uncorr) / 1000*

Variables

$Inc\ Cost\ per\ Ton\_EQ$	See Table 17.3.1	Deemed Plan A Incremental Capital Cost per Ton, Based On Unit Efficiency (New Construction)
$Cost\ per\ Ton\_baseline$	See Table 17.3.1	Baseline capital cost per ton for equipment
EER baseline	See Table 17.0.3	Baseline EER as calculated for residential equipment from the code required SEER.
SEER baseline	See Table 17.0.3	IECC 2012 identified code minimum SEER
Sizing Loss	See Table 17.0.4	
$Loss\_NoQI$	See Table 17.0.4	
$Loss\_Uncorr$	See Table 17.0.4	
$Inc\ Cost\_QI$	See Table 17.1.2	
Coincidence Factor_EQ	See Table 17.0.3	
Coincidence Factor_QI	See Table 17.0.3	
$iCoef0$	-0.02	AC or ASHP SEER to EER Conversion Coefficient used in polynomial equation shown (Reference 1)
$iCoef1$	1.12	AC or ASHP SEER to EER Conversion Coefficient used in polynomial equation shown (Reference 1)
EFLH_Cooling	See Table 17.0.1	Effective Full Load Hours for cooling load energy savings
EFLH_Heating_HP	See Table 17.0.1	Effective Full Load Hours for Heat Pump impacted energy savings
EFLH_Heat	See Table 17.0.1	Effective Full Load Hours for entire heating season including backup heat operation.
ASHP / MSHP operating temperature cutoff	35	Outdoor Ambient Temperature at which heat pump operation ceases and electric resistance heating begins

Balance Point Temperature	60	Outdoor Ambient Temperature at which residential cooling and heating load profiles equal zero BTUH
Max OAT	98	Maximum Outdoor Ambient Temperature used in building ASHP load profile; TMY3 basis
Min OAT	-23	Minimum Outdoor Ambient Temperature for caluclating full load heating; TMY3 Basis.
Balance Point Load	0	BTUH - Heating and cooling loads are zero at the balance point outdoor ambient temperature
HSPF_Adj_Factor	See Table 17.0.1	Adjustment factor for correcting HSPF from published data in climate zone IV to Minnesota Climate zone V. The HSPF_Adjustment_Factor for Electric Resistance Heat will be 1.
HSPF_Basline	See Table 17.0.3	Electric heating season performance factor or COP of 1. no climate zone correction required.
m_load_profile	Calculated	load profile slope (m)
b_load_profile	Calculated	load profile y intercept (b)
Full Load Heat	Calculated	calculated full load heating BTUH required to serve the home or space at the minimum Outside Air Temperature
Incremental Cost	See Table 17.3.1	Incremental cost per ton of new ASHP units except for the low income Home Energy Services Program.
Incremental Cost	See Table 17.3.2	Incremental cost per new ASHP unit for the low income Home Energy Services Program.
Incremental Cost	See Table 17.3.3	Incremental cost per new ASHP unit for the low income Low Income Multi-Family Savings Program.
Lifetime	18	for all ASHP units (Reference 17)
Minimum Qualifying Efficiency	See Table 17.0.2	

Conversion Factors

	3412	Conversion between BTU/h and kilowatts

Customer Inputs	**M&V Verified**	
Size_Cool	Yes	AHRI cooling size rating of Cooling equipment, AC, ASHP, MSHP
Size_Heat (Furnace)	No	Size of existing furnace associated with new AC in existing homes. This will be provided by the vendor. In the case where the size cannot be determined, the estimated size heat will be used.
Furnace Type	Yes	Condensing or non-Condensing, If Furnace Type is unknown, then Condensing will be used.
Qty_Prop_equip	Yes	quantity of proposed equipment
EER_Proposed	Yes	AHRI certified EER
SEER_Proposed	Yes	AHRI certified EER
HSPF_Proposed	Yes	AHRI certified for ASHP and MSHP units
Home Type	No	New or Existing home
County	No	Location of the home for determining weather zones.
BTUH Heating @ 47 F	Yes	BTUH capacity of heat pump units at specified temperature
BTUH Heating @ 17 F	Yes	BTUH capacity of heat pump units at specified temperature
Landlord Paid Utility?	No	For Home Energy Savings Program - Half of the incremental cost will be rebated if the landlord pays utilities

Table 17.3.1: Incremental Capital Costs - New Construction (Plan A) - Reference 6

SEER	ASHP Base Cost per Ton	ASHP Incremental Cost per Ton
13 SEER	N/A	N/A
14/14.5 SEER	$ 777.64	N/A
15 SEER	$ 960.40	$ 182.76
16 SEER	$ 1,143.16	$ 365.52
17/18+ SEER	$ 1,325.93	$ 548.29

Table 17.3.2 Incremental Capital Costs - Home Energy Savings Program

	Cost per Unit
16 SEER ASHP & Installation	$9,942.00

Table 17.3.3. Incremental Capital Costs - Low Income Multi-Family Savings Program

	Cost per Unit
16 SEER ASHP & Installation	$9,942.00

Changes from Recent Filing:

17.4 Res MSHP

Algorithms

$$Customer\ kW\ Savings = Customer\ kW_{EqCooling}$$

$$Customer\ Coincident\ kW\ Savings = Customer\ Coincident\ kW_{Equipment}$$

$$Customer\ kWh\ Savings = Customer\ kWh_{EqCooling} + Customer\ kWh_{EQHeating}$$

$$EER_{baseline} = (iCoef0\_c * (SEER\_Base / \frac{Size_{Cool}}{12{,}000}) \text{^}3 + iCoef1\_c * (SEER\_Base / \frac{Size_{Cool}}{12{,}000}) \text{^}2 + iCoef2\_c * (SEER\_Base / \frac{Size_{Cool}}{12{,}000}) + iCoef3\_c) * (\frac{Size_{Cool}}{12{,}000})$$

$$Customer\ kW_{EqCooling} = Qty_{prop} * \frac{Size_{Cool}}{12{,}000} * \left(\left(\frac{12}{EER_{baseline}}\right) - \left(\frac{12}{EER_{proposed}}\right)\right)$$

$$Customer\ kWh_{EqCooling} = Qty_{Prop} * \frac{Size\_Cool}{12{,}000} * EFLH_{cooling} * ((\frac{12}{SEER_{baseline}}) - \left(\frac{12}{SEER_{proposed}}\right))$$

$$Customer\ Coincident\ kW_{equipment} = Qty_{Prop} * Coincidence\ Factor * \frac{Size\_Cool}{12{,}000} * ((\left(\frac{12}{EER_{baseline}}\right) - \left(\frac{12}{EER_{Cooling}}\right))$$

$$Incremental\ Capital\ Cost_{Equipment} = Qty_{Prop} * Inc\ Cost\ per\ Ton_{EQ} * \frac{Size\_Cool}{12{,}000}$$

MSHP Heating Energy Savings

m_load_profile = (balance pt load - Size_Cool) / (balance pt temp - Max OAT)

*b_load_profile = Size_Cool - (m_load_profile * Max OAT)*

*Full Load Heat = m_load_profile * Min OAT + b_load_profile*

*HSPF_x_Adj = HSPF * HSPF_Adjustment_Factor*

$$Customer\ kWh_{EQHeating} = Qty_{Prop} * (-1 * Full\_Load\_Heat * EFLH\_Heating\_HP * ((1 / HSPF\_Baseline\_Adj - (1 / HSPF\_Proposed\_Adj)) / 1000$$

Variables

$Inc\ Cost\ per\ Ton\_EQ$	See Table 17.4.2	Deemed Plan A Incremental Capital Cost per Ton, Based On Unit Efficiency (New Construction)
$Cost\ per\ Ton\_baseline$	See Table 17.4.2	Baseline capital cost per ton for equipment
EER baseline	See Table 17.0.3	Baseline EER as calculated for residential equipment from the code required SEER.
SEER baseline	See Table 17.0.3	IECC 2012 identified code minimum SEER
Coincidence Factor	See Table 17.0.3	
iCoef0__c	See Table 17.4.1	MSHP SEER to EER Conversion Coefficient used in MSHP polynomial equation shown
iCoef1__c	See Table 17.4.1	MSHP SEER to EER Conversion Coefficient used in MSHP polynomial equation shown
iCoef2__c	See Table 17.4.1	MSHP SEER to EER Conversion Coefficient used in MSHP polynomial equation shown
iCoef3__c	See Table 17.4.1	MSHP SEER to EER Conversion Coefficient used in MSHP polynomial equation shown
EFLH_Cooling	See Table 17.0.1	Effective Full Load Hours for cooling load energy savings
EFLH_Heating_HP	See Table 17.0.1	Effective Full Load Hours for Heat Pump impacted energy savings
ASHP / MSHP operating temperature cutoff	35	Outdoor Ambient Temperature at which heat pump operation ceases and electric resistance heating begins
Balance Point Temperature	60	Outdoor Ambient Temperature at which residential cooling and heating load profiles equal zero BTUH
Max OAT	98	Maximum Outdoor Ambient Temperature used in building ASHP load profile; TMY3 basis
Min OAT	-23	Minimum Outdoor Ambient Temperature for caluclating full load heating; TMY3 Basis.
HSPF_Adj_Factor	See Table 17.0.1	Adjustment factor for correcting HSPF from published data in climate zone IV to Minnesota Climate zone V. The HSPF_Adjustment_Factor for Electric Resistance Heat will be 1.
HSPF_Baseline	See Table 17.0.3	Baseline heating season performance factor for code minimum MSHP. For Electric Resistance Heat Baseline the HSPF will be 3.412 based on a COP of 1 and does not require climate zone correction.
Balance Point Load	0	BTUH - Heating and cooling loads are zero at the balance point outdoor ambient temperature
m_load_profile	Calculated	load profile slope (m)
b_load_profile	Calculated	load profile y intercept (b)
Full Load Heat	Calculated	calculated full load heating BTUH required to serve the home or space at the minimum Outside Air Temperature
Furnace Eff	95% / 80%	Furnace efficiency based on customer provided Furnace Type; Condensing = 95% and Non-Condensing = 80%
Lifetime	See Table 17.0.3	for all MSHP units.
Minimum Qualifying Efficiency	See Table 17.1.2	

Customer Inputs	M&V Verified	
Size_Cool	Yes	AHRI cooling size rating of Cooling equipment, AC, ASHP, MSHP
Size_Heat (Furnace)	No	Size of existing furnace associated with new AC in existing homes. This will be provided by the vendor. In the case where the size cannot be determined, the estimated size heat will be used.
Furnace Type	Yes	Condensing or non-Condensing, If Furnace Type is unknown, then Condensing will be used.
Quantity proposed equipment	Yes	
EER proposed	Yes	AHRI certified EER
SEER proposed	Yes	AHRI certified EER
HSPF Proposed	Yes	AHRI certified for ASHP and MSHP units
Home Type	No	New or Existing home
County	No	Location of the home for determining weather zones.
BTUH Heating @ 47 F	Yes	BTUH capacity of heat pump units at specified temperature
BTUH Heating @ 17 F	Yes	BTUH capacity of heat pump units at specified temperature
Landlord Paid Utility?	No	For Home Energy Savings Program - Half of the incremental cost will be rebated if the landlord pays utilities

Table 17.4.1: SEER Conversion Coefficients

Equpiment type	Coef0	Coef1	Coef2	Coef3	Notes
MSHP - SEER to EER	-0.0002600	0.0101270	0.5263880	-0.0233300	Xcel Derivation

Table 17.4.2 Incremental Capital Costs - Mini-Split Heat Pump (Reference 8)

	Baseline Cost per ton Cooling	Incremental cost per ton Cooling
Mini-Split Heat Pump (15-20 SEER, 11+ EER, 9-12 HSPF)	$ 3,322.19	$ 401.99
Mini-Split Heat Pump (21-26 SEER, 11+ EER, 9-12 HSPF)	$ 3,535.64	$ 555.94

Changes from Recent Filing:

17.5 Furnace

Algorithms

$$Customer\ DTh = Qty\_Prop\_Equip\ *\ \left(\left(Size_{Heat} \times \frac{EFF_{Proposed}}{EFF_{Baseline}}\right) - Size_{Heat}\right) \times 1/(1 + Oversize\ Factor) \times \frac{EFLH_{heating}}{1{,}000{,}000}$$

$$Customer\ kW\ = Qty\_Prop\_Equip\ *\ (\ ECM\_Baseline\_kW\ -\ ECM\_Proposed\_kW\ )$$

$$Customer\ Coincident\ kW = Customer\ kW\ *\ Coincidence\_Factor$$

$$Customer\ kWh = Customer\ kW\ *\ ECM\_Operating\_Hours$$

$$Electric\_O\&M\_Cost\ -= Qty\_Prop\_Equip\ *\ ECM\_Heating\_Penalty$$

Variables

Eff_Baseline	See Table 17.5.3	Efficiency of baseline code minimum furnace or boiler
EFLH_Heating	See Table 17.0.1	Equivalent Full Load Heating Hours assumed for installed high efficiency furnace
Eff_Baseline	77.5%	Average efficiency of the Furnace or Boiler before tune-up over the two years
Eff_Proposed	80%	Efficiency of the Furnace or Boiler after the tune-up
ECM_Baseline_kW	See Table 17.5.5	Average PSC furnace fan kW (Reference 5, 6)
ECM_Proposed_kW	See Table 17.5.5	Average ECM furnace fan kW (Reference 5, 6)
ECM_Heating_Penalty	See Table 17.5.5	O&M Dollars spent in additional gas use to offset heating done by fan during winter
ECM_Operating_Hours	See Table 17.5.5	ECM furnace fan hours of operation
Coincidence_Factor	See Table 17.5.6	Percentage of Customer_kW savings that will coincide with peak summer kW savings
Oversize Factor	See Table 17.5.4	Oversizing factors used in selecting new boiler and furnace equipment
Incremental Cost Furnaces	See Table 17.5.1	Incremental costs of efficient equipment
Incremental Cost Boilers	See Table 17.5.2	Incremental costs of efficient equipment
Incremental Cost	See Table 17.5.6	Incremental costs of efficient equipment and Tune-ups for the Home Energy Savings Program
Lifetime	See Table 17.5.3	Measure Life for new Furnaces, Boilers, and Smart Thermostats
Lifetime	See Table 17.5.6	Measure Life for efficient equipment and Tune-ups for the Home Energy Savings Program
Conversion from Btu to Dth	1,000,000	1 Dth = 1,000,000 Btuh

Customer Inputs	**M&V Verified**	
$Size\_Heat$	Yes	New Furnace or Boiler namplate Input BTUH rating at sea level (BTUH, Input) provided by Customer
$EFF\_proposed$	Yes	Efficiency for higher efficiency Boiler or Furnace will be provided by the customer on the rebate form.
Qty_Prop_Equip	Yes	Quantity of installed equipment
County	No	Location of the home for determining weather zones.
Landlord Paid Utility?	No	For Home Energy Savings Program - Half of the incremental cost will be rebated if the landlord pays utilities

Table 17.5.1: Furnace Costs	**Incremental Cost New Home**	**Incremental Cost Existing Home**	**Baseline Cost New Home**	**Baseline Cost Existing Home**
95% Furnace	$307.89	$842.88	$761.28	$996.28
96% Furnace	$377.24	$908.22	$797.33	$1,028.31
97% Furnace	$616.27	$1,144.88	$816.00	$1,044.62

Table 17.5.2: Boiler Incremental Costs	**Incremental Cost New Home**	**Incremental Cost Existing Home**
85% Boiler	$122.84	$122.84
90% Boiler	$670.50	$670.50
95% Boiler	$1,421.90	$1,421.90

Table 17.5.3 (Reference 5)	**EFF baseline**	**Lifetime**
New Furnace in Existing Home	80%	18
New Furnace in New Home	90%	18
Boilers	84%	20
ENERGY STAR smart thermostat	n/a	10

Table 17.5.4: Oversize Factor	Oversize factor (Reference 5)
Existing Furnace 80% AFUE	30.0%
New Energy Star Furnace => 92% AFUE, < 96% AFUE	30.0%
New Energy Star Furnace => 96% AFUE	30.0%
Existing boilers => 78% - 82% AFUE	30.0%
New boilers => 85% AFUE	30.0%
New boilers => 90% AFUE	30.0%
New boilers => 95% AFUE	30.0%

Table 17.5.5: ECM Retrofit Savings	ECM_Baseline_kW	ECM_Proposed_kW	ECM_Operating _Hours	ECM_Heating_ Penalty
Retrofit ECM w/ AC	0.569	0.357	2,542	$ (9.50)
Retrofit ECM w/o AC	0.501	0.298	2,133	$ (9.50)

Table 17.5.6: HESP ECM & Tune-ups Life, Cost, and CF (Reference	Measure Life	Incremental Cost	Coincidence _Factor
Retrofit ECM w/ AC	7	$845.00	63%
Retrofit ECM w/o AC	7	$845.00	27%
95% Furnace & Installation	18	$3,918.50	N/A
95% Boiler & Installation	20	$8,855.00	N/A
Furnace Tune up	2	$270.00	N/A
Boiler Tune up	2	$305.50	N/A

Changes from Recent Filing:

Adopted MN TRM oversize factors and tuned it to match Xcel average home gas consumption.

17.5 Programmable T-stat

Algorithms

Customer kWh =Cooling_Delta_T x kWh_Savings_per_Degree

Customer kW = Cooling_Delta_T x kW_Savings_per_Degree

Customer Coincident kW = Customer kW x Coincdience Factor

Customer Dth =Heating_Delta_T x Dth_Savings_per_Degree

Variables

Variable ID:	Value	Description
kW_Savings_per_Degree	0.094	kW per degree F of setback (Reference 26, Reference 27)
kWh_Savings_per_Degree	65.669	kWh per degree F of setback (Reference 26, Reference 27)
kW_Savings_per_Degree_2	0.047	kW per degree F of setback for second thermostat = half of savings for first thermostat (Reference 26, Reference 27)
kWh_Savings_per_Degree_2	32.834	kWh per degree F of setback for second thermostat = half of savings for first thermostat (Reference 26, Reference 27)
Dth_Savings_per_Degree	3.218	Dth per degree F of setback (Reference 26, Reference 27)
Dth_Savings_per_Degree_2	1.609	Dth per degree F of setback for second thermostat = half of savings for first thermostat (Reference 26, Reference 27)
Coincidence Factor	See Table 17.6.1	Calculated using an assumed 3.1 hours away from home during peak coincident period
Measure Life	See Table 17.6.1	
Incremnetal Cost	See Table 17.6.2	

Customer Inputs	M&V Verified	
Cooling_Delta_T	Yes	Average difference between normal operation and cooling setback temperature in degrees F based on information provided by the customer during the interview. Collected through customer feedback cards in School Kits.
Heating_Delta_T	Yes	Average difference between normal operation and heating setback temperature in degrees F based on information provided by the customer during the interview. Collected through customer feedback cards in School Kits.

Table 17.6.1: Measure Life and Coincidence Factor (Reference 5)

Type of measure:	Measure life:	Coincidence Factor:
Programmable thermostat (CF and Hours apply to Cooling energy)	10	76%

Table 17.6.2: Measure Incremental Costs - A la Carte Measures

	Vendor Cost ($/Unit)	Low Income HE Squad ($/Unit)
Programmable Thermostat	$35.00	$35.00

Changes from Recent Filing:

Updated bin modelling for set back averages had impact on savings factors.

17.6 Smart T-stat

Algorithms

$$Customer\ kW = \left(Cooling\ kW \times ES\ Reduction_{cooling}\right) \times Cooling\ Scaling\ Factor$$

$$Customer\ kWh = \left(Baseline\ Cooling\ kWh \times ES\ Reduction_{cooling}\right) \times Cooling\ Scaling\ Factor + \left(Heating\ kW \times ES\ Reduction_{heating}\right) \times Hours_{heating} \times Heating\ Scaling\ Factor$$

$$Customer\ Coincident\ kW = \left(Cooling\ kW \times ES\ Reduction_{cooling}\right) \times Coincidence\ Factor \times Cooling\ Scaling\ Factor$$

$$CustomerDTh = \left(Baseline\ DTh \times ES\ Reduction_{heating}\right) \times Heating\ Scaling\ Factor$$

Variables

ES Reduction Heating	8%	Energy Star Connected Thermostat criteria for annual heating equipment runtime reduction (Reference 15)
ES Reduction Cooling	10%	Energy Star Connected Thermostat criteria for annual cooling equipment runtime reduction (Reference 15)
Cooling Scaling Factor	See Table 17.8.2	Cooling Scaling factor based on home type
Heating Scaling Factor	See Table 17.8.2	Heating Scaling factor based on home type
Average Home Cooling capacity	2.250	Average Home model capacity for Res Cooling (Tons)
Average Home Cooling efficiency SEER	13.400	Average Home model SEER rating
Average Home Cooling efficiency EER	11.417	Average Home model EER rating (converted from SEER)
Cooling kW	2.365	Average Home model kW for Res Cooling - 2.25 ton unit
Baseline Cooling kWh	760	Average cooling kWh input in baseline home (Reference 5)
Hours Cooling	See Table 17.0.1	Cooling Equivalent Full Load Hours
Baseline Dth	69.0	Average Heating Input Dtherms (Reference 5)
Heating kW	8.374	Equivalent full load heating demand kW
Hours Heating	See Table 17.0.1	Heating Equivalent Full Load Hours
EnergyStar_CF	76%	Calculated using an assumed 3.1 hours away from home during peak coincident period
Gas Heating System Effiiciency	80%	average heating system effiiciency in existing homes
Electric Heating System Effiiciency	100%	electric resistance heating system effiiciency in existing homes
Lifetime	10	Measure life for Energy Star Smart Thermostat EE Measure (Reference 5)
Incremental Cost	See Table 17.7.1	Incremental cost for ENERGY STAR smart thermostat (Reference 5)
Cooling Scaling Factor	See Table 17.7.2	Cooling Scaling factor based on home type
Heating Scaling Factor	See Table 17.7.2	Heating Scaling factor based on home type

Customer Inputs	**M&V Verified**	
Certified Energy Star Connected Thermostat	Yes	
Single Family Home	Yes	
Central AC	Yes	
Gas or Electric Resistance Heat	Yes	

Table 17.7.1	Incremental Cost
ENERGY STAR smart thermostat (Reference 5)	$200.00
Home Energy Squad Smart Thermostat	$125.00
Home Energy Squad upgraded Smart Thermostat	$225.00

Table 17.7.2 (Reference 28)

Smart Thermostat Type	Saver Switch	Single Family	Multi-Family	Townhome/Duplex
Cooling Scaling Factor	100%	100%	35%	64%
Heating Scaling Factor	100%	100%	15%	52%

Changes from Recent Filing:

17.7 Saver Switch

Algorithms

$$Customer\ kWh = Quantity\ Equipment * Equipment\ kWh\ Savings * Cooling\ Scaling\ Factor$$

$$Customer\ kW = Quantity\ Equipment * Equipment\ kW\ Savings * Cooling\ Scaling\ Factor$$

$$Customer\ Coincident\ kW = Quantity\ Equipment * Equipment\ PCkW\ Savings * Cooling\ Scaling\ Factor$$

Variables

Quantity Equipment	Customer Input	Quantity of smart saver switches installed.
Equipment kW Savings	See Table 17.8.1	Customer kW savings per unit with a smart switch or smart thermostat.
Equipment kWh Savings	See Table 17.8.1	Annual kWh savings per unit with a smart switch or smart thermostat (Reference 20 & Reference 21).
Equipment PCkW Savings	See Table 17.8.1	Peak Coincident kW savings perunit with a smart switch or smart thermostat (Reference 20 & Reference 22)
Lifetime	See Table 17.8.1	Length of time the switch will be operational
Cooling Scaling Factor	See Table 17.8.2	Cooling Scaling factor based on home type

Customer Inputs	**M&V Verified**	
Number of units with switch installed.	Yes	

Table 17.8.1	AC Saver's Switch	Water Heater Switch	Smart Thermostat DR
Eq.kW_Savings (kW)	0.748	0.200	1.109
Eq.kWh_Savings (kWh)	1	2	2
Eq.PC_kW_Customer_AC (PC_kW)	0.748	0.200	1.109
Lifetime (years)	15	15	5

Table 17.8.2 (Reference 28)

Smart Thermostat Type	Saver Switch	Single Family	Multi-Family	Townhome/Duplex
Cooling Scaling Factor	100%	100%	35%	64%
Heating Scaling Factor	100%	100%	15%	52%

Changes from Recent Filing:

17.9 ENERGY STAR Radon Fans

Algorithms:

$$Customer\ kWh = (1 - \%EE\ Fans\ Installed) \times (kWB_{aseline} - kWENERGYSTAR) \times Hours$$

$$Customer\ kW = \frac{Customer\ kWh}{Hours}$$

$$Customer\ Coincident\ kW = \frac{Customer\ kWh}{Hours} \times Coincidence\ Factor$$

Variables:	Value	Description
Measure Life	10	Life of an energy star Radon Fan (Reference 24)
Hours	8,760	Assumed Hours of operation for a radon fan
% EE Fans Installed	15%	Assumed percentage of Energy Star Radon Fans being sized correctly and installed currently based on contractor feedback (Reference 23)
Incremental Cost	$0.00	Incremental cost of RP140 as compared to RP145 (Reference 25)
Pipe Diameter (in)	4.00	Assumption based on contractor feedback (Reference 24)
Pipe Length (ft)	25.00	Assumption based on contractor feedback (Reference 24)
Efficient Radon Fan Operating Pressure	0.68	Operating Pressure in "WC (Reference 24)
Baseline Radon Fan Operating Pressure	1.30	Operating Pressure in "WC (Reference 24)
Coincidence Factor	100%	Fans run 24x7x365

Table 1

kW_{base}	0.054	Reference 23
kW_{ES}	0.017	Reference 23
Efficient Radon Fan Airflow	33.30	Reference 23
Baseline Radon Fan Airflow	63.20	Reference 23

Changes from Recent Filing:

None

17.9 Eco+

Algorithms

$$Customer\ kW = \left(Cooling\ kW\ -\ Cooling\ kW \times ES\ Reduction_{cooling}\right) \times Eco{+}\ Reduction$$

$$Customer\ kWh = \left(Baseline\ Cooling\ kWh -\ Baseline\ Cooling\ kWh \times ES\ Reduction_{cooling}\right) \times\ Eco{+}\ Reduction \times Hours_{cooling}$$

$$Customer\ Coincident\ kW = \left(Cooling\ kW\ -\ Cooling\ kW \times ES\ Reduction_{cooling}\right) \times\ Eco{+}\ Reduction \times Coincidence\ Factor$$

Variables

ES Reduction Cooling	10%	Energy Star Connected Thermostat criteria for annual cooling equipment runtime reduction (Reference 15)
Average Home Cooling capacity	2.250	Avgerage Home model capacity for Res Cooling (Tons)
Average Home Cooling efficiency SEER	13.400	Avgerage Home model SEER rating
Average Home Cooling efficiency EER	11.417	Avgerage Home model EER rating (converted from SEER)
Cooling kW	2.365	Avgerage Home model kW for Res Cooling - 2.25 ton unit
Baseline Cooling kWh	760	Average cooling kWh input in baseline home (Reference 5)
Hours Cooling	See Table 17.0.1	Cooling Equivalent Full Load Hours
Baseline Dth	69.0	Average Heating Input Dtherms (Reference 5)
EnergyStar_CF	76%	Calculated using an assumed 3.1 hours away from home during peak coincident period
Lifetime	10	See Smart Thermostat Measure Life
Incremental Cost	$0.00	Incremental cost for ENERGY STAR smart thermostat (Reference 5)
Eco+ Reduction	2%	Assumed percent savings from Eco+ product

Customer Inputs	**M&V Verified**	
Certified Energy Star Connected Thermostat	Yes	

Changes from Recent Filing:

Measure added for existing AC Rewards Smart Thermostat Customers in 2020.

17.11 Room AC

Algorithms

$$Customer\ kWh = Customer\ kW * EFLH\_Cool$$

$$Customer\ kW = Size\_Cool * (1 / CEER\_Base - 1 / CEER\_Eff) / 1000$$

$$Customer\ Coincident\ kW = Customer\ kW * CF$$

Variables

CF	0.75	Coincidence Factor
EFLH_Cool	See Table 17.0.1	Equivalent full load hours
CEER_Base	See Table 17.11.1	Combined Energy Efficiency Ratio for federal minimum Room AC unit based on size
CEER_Eff	See Table 17.11.1	Combined Energy Efficiency Ratio for Energy Star qualified Room AC unit based on size
Incremental Cost	See Table 17.11.2	Cost of new Room AC and Recycling of Room AC for the Home Energy Savings Program (HESP).
Incremental Cost	See Table 17.11.3	Cost of new Room AC and Recycling of Room AC for the Low Income Multi-Family Savings Program (MESP).
Lifetime New Room AC	9	lifetime of a new room window or wall AC unit
Lifetime Recycled Room AC	4.5	lifetime for a removed room window or wall AC unit

Customer Inputs	**M&V Verified**	
Size_Cool	Yes	BTUH size rating of new room AC unit
CEER_Eff	Yes	efficient rating of new room AC unit
Louvered Sides	Yes	configuration of new Room AC unit. The housing is constructed with or without louvered sides.
Without Louvered sides	Yes	configuration of new Room AC unit. The housing is constructed with or without louvered sides.
Landlord Paid Utility?	No	For Home Energy Savings Program - Half of the incremental cost will be rebated if the landlord pays utilities

Table 17.11.1: Combined Energy Efficiency Ratio (Reference 5)

	CEER_Base	CEER_Eff
Window AC Louvered Sides < 6000 BTUH	11.000	12.100
Window AC Louvered Sides >= 6000 to < 8000 BTUH	11.000	12.100
Window AC Louvered Sides >= 8000 to < 11000 BTUH	10.900	12.000
Window AC Louvered Sides >= 11000 to < 14000 BTUH	10.900	12.000
Window AC Louvered Sides >= 14000 to < 20000 BTUH	10.700	11.800
Window AC Louvered Sides >= 20000 to < 28000 BTUH	9.400	10.300
Window AC Louvered Sides >= 28000 BTUH	9.000	9.900
Wall AC w/o Louvered Sides < 6000 BTUH	10.000	11.000
Wall AC w/o Louvered Sides >= 6000 to < 8000 BTUH	10.000	11.000
Wall AC w/o Louvered Sides >= 8000 to < 11000 BTUH	9.600	10.600
Wall AC w/o Louvered Sides >= 11000 to < 14000 BTUH	9.500	10.500
Wall AC w/o Louvered Sides >= 14000 to < 20000 BTUH	9.300	10.200
Wall AC w/o Louvered Sides >= 20000 to < 28000 BTUH	9.400	10.300
Wall AC w/o Louvered Sides >= 28000 BTUH	9.400	10.300

Table 17.11.2. Incremental Capital Costs - Home Energy Savings Program

	Cost per Unit
Wall AC Unit	$727.50
Window AC Unit	$627.50
Window / Wall Air Conditioner Recycling	$50.00

Table 17.11.3. Incremental Capital Costs - Low Income Multi-Family Savings Program

	Cost per Unit
Wall AC Unit	$578.20
Window AC Unit	$392.00
Window / Wall Air Conditioner Recycling	$40.75

Changes from Recent Filing:

1. changed deemed savings values for AC with louvers and AC without louvers to the new CEER based savings calculation per MN TRM

17.0 DEEMED Tables

Table 17.0.1: Effective Full Load Hours	Cooling EFLH		Heating EFLH		Heat Pump Impacted Heating EFLH ** EFLH_Heating_HP			
	Single Family	Multi-Family	Single Family	Multi-Family	Single Family	Multi-Family	Altitude Adjustment Factor	HSPF Climate Zone Adjustment Factor
Zone 1 (Northern MN)	213	228	2,280	1,761			0.000	85%
Zone 2 (Central MN)	379	473	2,099	1,621			0.000	85%
Zone 3 (Southern MN/Twin Cities)	520	616	1,932	1,492	443	342	0.000	85%

Note: climate zones and hours based on the MN TRM v3.0

** the heat pump impacted hours are determined at a cutoff temperature of 35 F.

	Code Minimum						
Table 17.0.2: Minimum Qualifying Efficiency	SEER	EER	HSPF	Heating COP	Minimum Qualifying SEER	Minimum Qualifying EER	Minimum qualifying HSPF / COP
High Efficiency Air Conditioner - Split System	13.00	N/A	N/A	N/A	15.00	12.50	N/A
Air Source Heat Pump - Split System	14.00	N/A	8.20	N/A	15.00	12.50	9.00
Mini-Split & Multi-Split Heat Pumps	14.00	N/A	8.20	N/A	16.00	11.00	9.00
Gorund Source Heat Pump **	14.10	14.10	N/A	3.20	16.00	16.00	4.00

** Ground Loop Brine to Air with entering temperatures of 77 F cooling mode and 32 F heating mode

Table 17.0.3: Coincidence Factors, Baseline Efficiencies and Lifetimes

Equipment Type	Deemed Equipment Coincidence Factor	Deemed QI Coincidence Factor	SEER Baseline	EER Baseline	HSPF_ Baseline	COP_Baseline (Electric Resistance Heating)	Lifetime	Notes
High Efficiency Air Conditioner	90%	100%	13.00	11.18	N/A	N/A	18	(Reference 17)
Air Source Heat Pump	90%	100%	14.00	11.76	8.20	1.00	18	(Reference 17)
Mini-Split & Multi-Split Heat Pumps	90%	N/A	14.00	Varies	8.20	1.00	15	
Gorund Source Heat Pump **	90%	100%	13.00	11.18	N/A	1.00	20	

** Baseline for GSHP is Code minimum AC and Gas Fired Furnace.

Table 17.0.4: QI Factors (Reference 4, Reference 6, Reference 7, Reference 14)

Home Type - equipment type	Sizing Loss	Refrigeration Charge	Improper Airflow	Duct Leakage	Loss NO QI	Loss_Uncorr
New Home - AC/ASHP	0%	7.0%	2.0%	0%	9.0%	0%
Existing Home - AC/ASHP	2.0%	7.0%	2.0%	8.3%	17.3%	3.7%
New Home - GSHP	0%	0.0%	2.0%	0%	2.0%	0%
Existing Home - GSHP	2.0%	0.0%	2.0%	8.3%	10.3%	3.7%
New Home MSHP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Existing Home MSHP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 17.0.5: Conversion Factors

Conversion Factor from BTUH to kW	3,412	BTU/kW-hr
Btu to Dth	1,000,000	BTU/Dth
Therm to Dth	10	Therm/Dth
Btu to Therm	100,000	Btu/Therm
Convert from Btu/wh to kW/ton	12	Btu/wh per kW/ton
Conversion between watts and kilowatts	1,000	watts/kilowatt
Conversion between BTU/h and tons	12,000	BTUh / ton

18.3 Recommissioning Implementation

Algorithms

$$Customer\ kWh = \left(kWh_{Baseline} - kWh_{Proposed}\right)$$

$$Customer\ kW = kW_{Baseline} - kW_{Proposed}$$

Customer may apply for rebate based upon the recommendations provided in the Xcel Energy-funded Study or Assessment. Each measure will be provided by a study consultant and reviewed by Xcel Energy. Technical variables will be provided by the study consultant. Analysis will be based on standard engineering methodologies. Electrical energy savings and electrical demand savings will be calculated based on the project specific details.

Variables

Lifetime	7

18.4 Targeted Building Assessment RCx Implementation

Algorithms

$$Customer\ kWh = \left(kWh_{Baseline} - kWh_{Proposed}\right)$$

$$Customer\ kW = kW_{Baseline} - kW_{Proposed}$$

Customer may apply for rebate based upon the recommendations provided in the Xcel Energy-funded Study or Assessment. Each measure will be provided by a study consultant and reviewed by Xcel Energy. Technical variables will be provided by the study consultant. Analysis will be based on standard engineering methodologies. Electrical energy savings and electrical demand savings will be calculated based on the project specific details.

Variables

Lifetime	7

#18.7 BOC

Algorithms

$$Customer\ kWh = ft^2 \times \left[\frac{kWh}{ft^2}\right]$$

$$Customer\ kW = CF \times \frac{Customer\ kWh}{hours}$$

$$Customer\ therms = ft^2 \times \left[\frac{therms}{ft^2}\right]$$

Variables

$\left[\frac{kWh}{ft^2}\right]$	0.121	kWh/sqft of attributable savings (Reference 1)
$\left[\frac{therms}{ft^2}\right]$	0.00806	Therms/sqft of attributable savings (Reference 1)
CF	33.00%	Average of Implemented Recommissioning program measures
hours	8760	Hours per year
Lifetime	5	years (Reference 2)

Customer Inputs	**M&V Verified**	
ft^2		Building Area

References:

1. Department of Energy Resource Technical Reference Manual Version 2.1
2. BOC-Expansion Initiative Market Progress Evaluation Report #1; http://theboc.info/pdf/Eval-BOC-expansion-initiative-market-progress-0414.pdf

18.8 Commercial Efficiency RCx Implementation

Algorithms

$$Customer\ kWh = \left(kWh_{Baseline} - kWh_{Proposed}\right)$$

$$Customer\ kW = kW_{Baseline} - kW_{Proposed}$$

Customer may apply for rebate based upon the recommendations provided in the Xcel Energy-funded Study or Assessment. Each measure will be provided by a study consultant and reviewed by Xcel Energy. Technical variables will be provided by the study consultant. Analysis will be based on standard engineering methodologies. Electrical energy savings and electrical demand savings will be calculated based on the project specific details.

Variables

Lifetime	7

18.11 Commercial Streamlined Assessment RCx Implementation

Algorithms

$$Customer\ kWh = \left(kWh_{Baseline} - kWh_{Proposed}\right)$$

$$Customer\ kW = kW_{Baseline} - kW_{Proposed}$$

Customer may apply for rebate based upon the recommendations provided in the Xcel Energy-funded Study or Assessment. Each measure will be provided by a study consultant and reviewed by Xcel Energy. Technical variables will be provided by the study consultant. Analysis will be based on standard engineering methodologies. Electrical energy savings and electrical demand savings will be calculated based on the project specific details.

Variables

Lifetime	7

18.15 EIS RCx Implementation

Algorithms

$$Customer\ kWh = \left(kWh_{Baseline} - kWh_{Proposed}\right)$$

$$Customer\ kW = kW_{Baseline} - kW_{Proposed}$$

Customer may apply for rebate based upon the recommendations provided in the Xcel Energy-funded Study or Assessment. Each measure will be provided by a study consultant and reviewed by Xcel Energy. Technical variables will be provided by the study consultant. Analysis will be based on standard engineering methodologies. Electrical energy savings and electrical demand savings will be calculated based on the project specific details.

Variables

Lifetime	7

18.22 Lighting Redesign Implementation

Algorithms

$$Customer\ kWh = \left(kWh_{Baseline} - kWh_{Proposed}\right)$$

$$Customer\ kW = kW_{Baseline} - kW_{Proposed}$$

Customer may apply for rebate based upon the recommendations provided in the Xcel Energy-funded Lighting Redesign Study. Each Lighting Redesign measure will be provided by a study consultant and reviewed by Xcel Energy. Technical variables will be provided by the study consultant. Analysis will be based on standard engineering methodologies. Electrical energy savings and electrical demand savings will be calculated based on the project specific details.

Variables

Lifetime	20

18.24 Process Efficiency RCx Implementation

Algorithms

$$Customer\ kWh = \left(kWh_{Baseline} - kWh_{Proposed}\right)$$

$$Customer\ kW = kW_{Baseline} - kW_{Proposed}$$

Customer may apply for rebate based upon the recommendations provided in the Xcel Energy-funded Study or Assessment. Each measure will be provided by a study consultant and reviewed by Xcel Energy. Technical variables will be provided by the study consultant. Analysis will be based on standard engineering methodologies. Electrical energy savings and electrical demand savings will be calculated based on the project specific details.

Variables

Lifetime	7

18.26 Industrial Streamlined RCx Implementation

Algorithms

$$Customer\ kWh = \left(kWh_{Baseline} - kWh_{Proposed}\right)$$

$$Customer\ kW = kW_{Baseline} - kW_{Proposed}$$

Customer may apply for rebate based upon the recommendations provided in the Xcel Energy-funded Study or Assessment. Each measure will be provided by a study consultant and reviewed by Xcel Energy. Technical variables will be provided by the study consultant. Analysis will be based on standard engineering methodologies. Electrical energy savings and electrical demand savings will be calculated based on the project specific details.

Variables

Lifetime	7

Table 18.1.1: Lifetime Assumptions

Years	Measure Group
7	Recommissioning Implementation
20	Lighting Redesign

19.1 Showerheads & Aerators

Algorithms

$$\Delta T_{WH} = T_{WH} - T_{city}$$

$$Gas\ Savings\ (Gross\ Dth) = \frac{GPY_{saved} * \Delta T_{WH} * H_{water} * Split\ Factor}{EFF_{WH,gas} * 1{,}000{,}000}$$

$$Energy\ Savings\ (Customer\ kWh) = \frac{GPY_{saved} * \Delta T_{WH} * H_{water} * (1 - Split\ Factor)}{EFF_{WH,electric} * 3{,}412}$$

$$Demand\ Savings\ (Customer\ kW) = \frac{Customer\ kWh}{8760}$$

$$Demand\ Savings\ (Customer\ PCkW) = Customer\ kW * CF$$

Variables

T_{WH}	120	Water heater setpoint temperature °F. (Reference 1)
T_{city}	51.9	Water temperature of city water entering the water heater °F. (Reference 2)
GPY_{saved}	See Table 19.2.1	Gallons per year of hot water saved with high-efficiency showerhead or aerator.
ρ_w	8.34	Density of water in lb/gal
c_w	1	Specific heat of water in BTU/(lb·°F)
H_{water}	8.34	Heat content of 1 gallon of water in BTU/(gal·°F)
$EFF_{WH,gas}$	80%	Assumed gas water heater efficiency without standby losses. This only includes combustion efficiency.
$EFF_{WH,electric}$	100%	Assumed electric water heater efficiency without standby loses.
Split Factor	See Table 19.1.1	Gas/electric split factor is based on customer response to showerhead post card. The customer selects from three options for water heating fuel.
Conversion from Dth to BTH	1,000,000	1 Dth = 1,000,000 Btu
Conversion from kWh to BTU	3,412	1 kWh = 3,412 Btu
CF	See Table 19.2.1	Amount of Customer kW demand that will coincide with peak utility system demand.
Baseline Showerhead Flowrate	2.5	Baseline showerhead flowrate in gallons/minute per federal minimum standards
Baseline Faucet Aerator Flowrate	2.2	Baseline kitchen/bath faucet aerator flowrate in gallons/minute per federal minimum standards
Incremental Costs	See Table 19.3.1	Actual costs provided by vendor; cost per showerhead is assumed for the material costs for cost/benefit calculation purposes.
Measure Life	10	Lifetime in years of showerhead and aerator measures. (Reference 3)
Water Rate	$5.11	$ / 1000 Gallons
Sewer Rate	$19.63	$ / 1000 Gallons

Customer Inputs	**M&V Verified**
Showerhead received by customer	Yes
Showerhead installed by customer	Yes
Water Heating Fuel provided by Customer	Yes

Table 19.1.1	Gas_Split_Factor
Gas Water Heater	100%
Electric Water Heater	0%
Unknown Water Heater	88%

Table 19.2.1.A - Single Family

	Primary Showerhead			Secondary Showerhead			Kitchen Aerator	Primary Bath Faucet Aerator		Secondary Bath Faucet Aerator	
	Standard (1.5 GPM)	Handheld (1.5 GPM)	Styled (1.5 GPM)	Standard (1.5 GPM)	Handheld (1.5 GPM)	Styled (1.5 GPM)	(1.5 GPM)	(1.0 GPM)	(0.5 GPM)	(1.0 GPM)	(0.5 GPM)
GPY_{saved}	3,070	3,070	3,070	2,064	2,064	2,064	444	385	546	385	546
Hours	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760
Total Water Savings/Year - Gallons	3,937	3,937	3,937	2,647	2,647	2,647	492	494	700	494	700
CF	64%	64%	64%	64%	64%	64%	124%	124%	124%	124%	124%
O&M Savings	$97.39	$97.39	$97.39	$65.48	$65.48	$65.48	$12.18	$12.22	$17.31	$12.22	$17.31

Table 19.2.1.B - Multi-Family

	Primary Showerhead			Secondary Showerhead			Kitchen Aerator	Primary Bath Faucet Aerator		Secondary Bath Faucet Aerator	
	Standard (1.5 GPM)	Handheld (1.5 GPM)	Styled (1.5 GPM)	Standard (1.5 GPM)	Handheld (1.5 GPM)	Styled (1.5 GPM)	(1.5 GPM)	(1.0 GPM)	(0.5 GPM)	(1.0 GPM)	(0.5 GPM)
GPYsaved	3,630	3,630	3,630	474	474	474	588	437	619	437	619
Hours	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760
Total Water Savings/Year - Gallons	4,656	4,656	4,656	607	607	607	637	560	794	560	794
CF	64%	64%	64%	64%	64%	64%	124%	124%	124%	124%	124%
O&M Savings	$115.17	$115.17	$115.17	$15.02	$15.02	$15.02	$15.75	$13.86	$19.63	$13.86	$19.63

Table 19.3.1 - Incremental Costs

	Primary Showerhead			Secondary Showerhead			Kitchen Aerator	Primary Bath Faucet Aerator		Secondary Bath Faucet Aerator	
	Standard (1.5 GPM)	Handheld (1.5 GPM)	Styled (1.5 GPM)	Standard (1.5 GPM)	Handheld (1.5 GPM)	Styled (1.5 GPM)	(1.5 GPM)	(1.0 GPM)	(0.5 GPM)	(1.0 GPM)	(0.5 GPM)
Energy Efficient Showerhead - 2021	$3.25	$8.65	$4.25	$3.25	$8.65	$4.25	$1.64	$0.52	-	$0.52	-
Energy Efficient Showerhead - 2022	$3.25	$8.65	$4.25	$3.25	$8.65	$4.25	$1.64	$0.52	-	$0.52	-
Energy Efficient Showerhead - 2023	$3.25	$8.65	$4.25	$3.25	$8.65	$4.25	$1.64	$0.52	-	$0.52	-
Home Energy Squad	$3.50	$9.50	-	$3.50	$9.50	-	$1.25	-	$1.50	-	-
Low Income Home Energy Squad	$3.50	$9.50	-	$3.50	$9.50	-	$1.25	-	$1.50	-	-
Multifamily Building Efficiency	$5.60	$16.25	-	$5.60	$16.25	-	$2.86	$1.48	$4.00	$1.48	$4.00
Multifamily Building Efficiency Renter Kits	$0.00	-	-	-	-	-	$0.00	$0.00	-	-	-
Home Energy Savings Program	$15.00	$47.00	-	$15.00	$47.00	-	$5.20	-	$5.20	-	$5.20
School Education Kits	$3.22	-	-	-	-	-	$1.22		$0.48	-	-

*Note that these incremental costs are estimates. Actual incremental costs will be used when they are known.

References:

1. Development of Standardized Deomestic Hot Water Event Schedules for Residential Buildings; R. Hendron and J. Burch; NREL/CP-550-40874
2. United States Department of Energy. DHW Event Schedule Generator. (365 day average water main temperature for Minneapolis-St Paul Intl AP, MN). http://energy.gov/eere/buildings/downloads/dhw-event-schedule-generator
3. DEER Database for Energy Efficient Resources version 2014; www.deeresources.com
4. Water and sewer rates from https://www.stpaul.gov/sites/default/files/Media%20Root/Water%20Services/SPRWS_2020_SaintPaulRates.pdf
5. Xcel Energy New Mexico Residential Shower Use Study
6. The Effect of Efficiency Standards on Water Use and Water Heating Energy Use in the U.S.: A Detailed End-use Treatment; J Koomey, C Dunham, J Lutz; LBL-35475
7. Residential Energy Consumption Survey 2009; http://www.eia.gov/consumption/residential/

Changes from Recent Filing:

19.2 Water Heaters

Algorithms

$Hot\ Water\ Energy\ (Tank-Type) = Qty\ x\ Hot\_Water\_Consumption\ x\ Water\_Heater\_Delta\_T\ x\ Days\_Per\_Year\ x\ Water\_Density$

Hot Water Energy (Tankless) = Qty x Hot_Water_Consumption x Water_Heater_Delta_T x Days_Per_Year x Water_Density

Water Heater Delta T = Water_Heater_Temperature - City_Mains_Temperature

Gas Equations

Customer_Dth = Baseline_Dth - Proposed_Dth

Baseline_Dth = Hot_Water_Energy / Baseline_Eff_Gas / 1,000,000

Proposed_Dth = Hot_Water_Energy / Proposed_Eff / 1,000,000

Baseline Efficiency Gas-Fired Storage WH = coef1 - (coef2 x Proposed_Tank_Size)

Electric Equations:

Customer kWh = Baseline_kWh - Proposed kWh + Cooling_Benefit kWh + Heating_Penalty kWh

Baseline_kWh = Hot_Water_Energy / Baseline_Eff_Electric / 3,412

Proposed_kWh = Hot_Water_Energy / Proposed_Eff / 3,412

Baseline_Eff_Electric = coef1 - (coef2 x Basline_Tank_Size)

Customer kW = Baseline_kW - Proposed_kW

Baseline_kW = Baseline_kWh / 8760 + Cooling_Benefit_kWh / Cooling_Hrs

Proposed_kW = Proposed_kWh / 8760

Customer_PCkW = Customer_kW x Coincidence_Factor

*Heating_Penalty_kWh = -1 * (Hot Water Energy / Proposed_Eff) / Heating_Eff * Heating Hours / 8760 / 3,412*

*Heating_Penalty_Dth = -1 * (Hot Water Energy / Proposed_Eff) / Heating_Eff * Heating Hours / 8760 / 1,000,000*

*cooling_Benefit_kWh = (Hot Water Energy / Proposed_Eff) / (Cooling_SEER * 1000 / 3412) * Cooling_Hrs / 8760 / 3412*

*Heat Penalty Energy O&M = Heating_Penalty_Dth * Heating Energy O&M Rate*

Variables

Hot Water Consumption	See Table 19.2.4	Gallons of Water per day based on number of Bedrooms and Home Type
Water Heater Temperature	120.0	Water Heater Tank Temperature
City Mains Temperature	51.3	Water Main temperature average over the year
Conversion from Btu to Dth	1,000,000	1 Dth = 1,000,000 Btuh
Conversion from Btu to Therm	100,000	1 Therm = 100,000 Btuh
1 Therm = 100,000 Btuh	1,000	1 kW = 1,000 Watts
Conversion from Btu to kWh	3,412	1 kW = 3,412 Btuh
Specific Heat of Water	1	Btu/lb/°F
Water_Density	8.34	lb/gal H20
Days_Per_Year	365	Days per Year
Coeff1	See Table 19.2.1	Code based forumula for calculation of Baseline efficiency based on water heater type and draw pattern provided by customer
Coeff2	See Table 19.2.1	Code based forumula for calculation of Baseline efficiency based on water heater type and draw pattern provided by customer
Baseline_Tank_Size	See Table 19.2.3	Baseline Electric Resistance Water Heater Tank Size and Quantity determined by number of bedrooms. Tank Size used in baseline efficiency equation.
Gas Heating System Efficiency	80%	For homes with Gas heating systems the assumed efficiency for calculating HPWH O&M heating penalty
Air Source Heat Pump Heating System Efficiency	1.92	For homes with ASHP heating systems the assumed efficiency for calculating HPWH O&M heating penalty in COP (corrected for MN climate region V)
Electric Resistance Heating Efficiency	100%	for homes with electric resistance heat the assumed heating efficiency
Cooling System Efficiency	13.4	SEER of the typical home cooling system for calculating HPWH Cooling benefit
Coincidence_Factor	100%	We are using the average water heater savings over the summer hours.
Hours per Year	8760	total hours in a year
Heating Hours	6253	Hours in the year at or below the heating enable temp of 62 F
Cooling Hours	663	Hours in the year at or above the cooling enable temp of 77 F
Water Heater Self-Installation Rate	52%	Percent of Water Heaters that self-installed after retail purchase (Reference 9)
ERWH DR kWh Savings	0.728	kWh savings per year for averge number of annual events called in residential demand response Electric Resistance WH Unit with a smart switch and no load shifting preparation.
ERWH DR PCkW @ Customer Savings	0.213	Peak Coincident kW savings per average residential ERWH Unit with a smart switch (Reference 3) and no load shifting preparation.
HPWH DR kWh Savings	0.303	kWh savings per year per event Residential Heat Pump WH Unit with a smart switch and no load shifting preparation.
HPWH DR PCkW @ Customer Savings	0.059	Peak Coincident kW savings for averge number of annual events for average Residential HPWH Unit with a smart switch (Reference 3) and no load shifting preparation.
HPWH Load Shifting & DR kWh Savings	151.521	kWh savings per year for daily load shifting in Residential Heat Pump WH Unit with a smart switch.
HPWH Load Shifting & DR PCkW @ Customer Savings	0.071	Peak Coincident kW savings per year for daily load shifting in Residential HPWH Unit with a smart switch (Reference 3).

Customer Inputs	M&V Verified	
Number of Bedrooms	Yes	total number of bedrooms in the home where a new water heater is being installed
Proposed Tank Size	Yes	Storage Water Heater tank size for gas fired water heaters.
Proposed Eff	Yes	Proposed water heater efficinecy as a UEF
Quantity Proposed Equipment	Yes	
Instantaneous Water Heater Max GPM Rating	Yes	
Landlord Paid Utility	No	Home Energy Services Program requires identification of Landlord Paid Utilities vs.
Vendor Water Heater Cost	No	Home Energy Services Program costs are Vendor Provided
Water Heater Draw Pattern	No	

Table 19.2.1 Gas Fired Storage Water Heater and Heat Pump Water Heater Baseline Efficiency Calculation Parameters (Reference 8)

	First Hour Rating to Define Draw Pattern		Electric Storage Water Heater >=20 Gallon and <=55 Gallon Baseline Efficiency Coefficients		Gas Storage Water Heater ≥20 gal and ≤55 gal Baseline Efficiency		Gas Storage WH >55 Gallon and <=100 Gallon Baseline Efficiency	
Draw Pattern	min (>=Gallons)	max (< Gallons)	coef1	coef2	coef1	coef2	coef1	coef2
Very Small	1	18	0.8808	0.0008	0.3456	0.0020	0.6470	0.0006
Low	18	51	0.9254	0.0003	0.5982	0.0019	0.7689	0.0005
Medium	51	75	0.9307	0.0002	0.6483	0.0017	0.7897	0.0004
High	75	No Upper Limit	0.9349	0.0001	0.6920	0.0013	0.8072	0.0003

Table 19.2.2 Instantaneous Gas Fired Water Heater baseline Efficiency calculation parameters (Reference 8)

	Instantaneous Gas-Fired Water Heater <2 gal and >50,000 Btu/h GPM Drawn		Instantaneous Water Heater Baseline Efficiency Coefficients	
Draw Pattern	Minimum (>=GPM)	Maximum (< GPM)	coef1	coef2
Very Small	0	1.7	0.8000	0.0000
Low	1.7	2.8	0.8100	0.0000
Medium	2.8	4	0.8100	0.0000
High	4	No Upper Limit	0.8100	0.0000

Table 19.2.3 2019 ASHRAE HVAC Applications Chapter 51 Service Water Heating: Table 4 HUD-FHA Minimum Water Heater Capacities for One- and Two-Family Living Units (Reference 13)

Water Heater Type	1	2	3	4	5	6
Average Electric Storage First Hour Draw	30	51	67	80	88	102
Baseline Quantity Electric Storage Tanks	1	1	1	2	2	2
Baseline Tank Volume Electric Storage Tanks	30	40	55	30	30	40
Baseline Wattage per Electric Storage Tank	3.8	4.5	4.5	4.5	4.5	4.5
Average Gas Storage First Hour Draw	43	60	67	77	90	92
Average Baseline tank size for gas tankless WH	20	30	35	40	50	50

Table 19.2.4 Water Usage per Day by Number of Bedrooms (Reference 12)

Home Type	1	2	3	4	5	6
Single Family total HW usage per day	34	48	60	72	84	96
Multi-Family total HW usage per day	41	53	63	73	83	92

Table 19.2.5 - Incremental Cost, Lifetime - References 3, 10

Water Heater Type	Stoarge Tank Size	Manufacturer's Draw Pattern	Baseline Cost	Incremental Cost	Lifetime
High Efficiency Storage Water Heater	Volume <= 40 Gallon	MEDIUM	$ 906.99	$ 126.88	13
High Efficiency Storage Water Heater	Volume <= 40 Gallon	HIGH	$ 833.02	$ 260.86	13
High Efficiency Storage Water Heater	Volume > 40 Gallon	MEDIUM	$ 714.09	$ 119.30	13
High Efficiency Storage Water Heater	Volume > 40 Gallon	HIGH	$ 958.42	$ 384.34	13
High Efficiency Tankless Water Heater	N/A	MEDIUM	$ 975.06	$ 541.99	20
High Efficiency Tankless Water Heater	N/A	HIGH	$ 1,071.37	$ 861.92	20
Air Source Heat Pump Water Heater	N/A	Any	$ 958.62	$ 784.00	13

Table 19.2.6: Home Energy Savings Program Measure Incremental Costs	Estimated Incremental Cost
68% UEF Storage Water Heater Replacement *	$1,770.20
New Heat Pump Water Heater	$3,778.00
New High Efficiency Storage Water heater - High Draw	$1,725.00
New High Efficiency Storage Water heater - Medium Draw	$1,598.26

* Vendors provide actual cost data

Table 19.2.7: Water Heater DR Incremental costs	Incremental Cost
Cost of connectivity and mixing valve	$325.00

References:

1. Energy Conservation Program for Consumer Products: Test Procedure for Water Heaters; United States Department of Energy; http://www.gpo.gov/fdsys/pkg/FR-1998-05-11/pdf/98-12296.pdf
2. United States Department of Energy. DHW Scheduler. Value is average water main temperature MSP Intl AP. http://energy.gov/eere/buildings/downloads/building-america-standard-dhw-schedules
3. ENERGY STAR Residential Water Heaters Final Criteria Analysis.
https://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/water_heaters/WaterHeaterAnalysis_Final.pdf
4. US Department of Energy; Residential Water Heater Standards; http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/27
5. 2010 - 2012 W0017 Ex Ante Measure Cost Study Final Report. http://www.energydataweb.com/cpucFiles/pdaDocs/1100/2010-2012%20WO017%20Ex%20Ante%20Measure%20Cost%20Study%20-%20Final%20Report.pdf
9. Making ENERGY STAR® Water Heaters a National Early Replacement Priority - dated Feb 23,2016
11. NREL's National Residential Efficiency Measure Database https://remdb.nrel.gov/measures.php?gId=6&ctId=270
12. Florida Solar Energy Center - "Estimating Daily Domestic Hot-Water Use in North American Homes" dated June 30,2015: Table 5 Climate-Normalized Fixture (nFgpd) and Waste (nWgpd) Gallons per Day as a Function of the Number of Bedrooms (BR) in a Home
13. 2019 ASHRAE HVAC Applications Chapter 51 Service Water Heating.

Changes from Recent Filing:

19.3 Commercial Aerators

Algorithms

$$\Delta T_{WH} = T_{WH} - T_{city}$$

$$Gas\ Savings\ (Gross\ Dth) = Quantity * \frac{\rho_w * c_w * WtrSave * \Delta T_{WH}}{EFF_{WH,gas} * 1{,}000{,}000}$$

$$Energy\ Savings\ (Customer\ kWh) = Quantity * \frac{GPY_{saved} * \Delta T_{WH} * H_{water}}{EFF_{WH,electric} * 3{,}412}$$

$$Demand\ Savings\ (Customer\ kW) = \frac{Customer\ kWh}{8760}$$

$$Demand\ Savings\ (Customer\ PCkW) = Customer\ kW * CF$$

$$GPYsaved = (Baseline_{GPM} - Proposed_{GPM}) * Runtime_{Hours} * Facility_{Days} * 60$$

$$O\&M\ Savings = Quantity * GPY_{saved} * (Water_{Rate} + Sewer_{Rate})/1000$$

Variables

T_{WH}	See Table 19.1.3	Water heater setpoint temperature °F.
T_{city}	51.9	Water temperature of city water entering the water heater °F. (Reference 12)
ρ_w	8.34	Density of water in lb/gal
c_w	1	Specific heat of water in BTU/(lb·°F)
Hwater	8.34	Heat content of 1 gallon of water in BTU/(gal·°F)
$EFF_{WH,gas}$	80%	Assumed gas water heater efficiency
$EFF_{WH,electric}$	98%	Assumed electric water heater efficiency
Conversion from Dth to BTH	1,000,000	1 Dth = 1,000,000 Btu
Conversion from kWh to BTU	3,412	1 kWh = 3,412 Btu
CF	See Table 19.2.3	Amount of Customer kW demand that will coincide with peak utility system demand.
Baseline GPM	See Table 19.2.3	Baseline flowrate in gallons/minute per federal minimum standards
Proposed GPM	See Table 19.2.3	Nameplate flow rate of proposed equipment
Runtime Hours	See Table 19.2.3	Number of hours per day equipment is used
Facility Days	See Table 19.3.3	Number of days per year the equipment is operated based on building type
Incremental Costs	See Table 19.4.3	Actual costs provided by vendor; cost per showerhead is assumed for the material costs for cost/benefit calculation purposes.
Measure Life	See Table 19.4.3	Lifetime in years of pre-rinse sprayer and aerator measures.
Water Rate	$3.97	$ / 1000 Gallons (Reference 11)
Sewer Rate	$5.99	$ / 1000 Gallons (Reference 11)

Customer Inputs	**M&V Verified**	
Quantity	Yes	Number of units to be installed
Building Type	Yes	Building type in which the equipment is to be installed
Water Heating Fuel	Yes	Electric or gas water heater

Table 19.1.3 Hot Water Set Point Temp (F)

Equipment	Degrees F
Kitchen Aerator	125
Restroom Aerator	105
Pre-Rinse Sprayer	125

Table 19.2.3 Aerator Information

	Baseline GPM	Proposed GPM	Runtime Hours	CF
Kitchen Aerator	2.2	1.5	0.167	1%
Restroom Aerator	2.2	0.6	0.500	2%
Pre-Rinse Sprayer	1.6	1.3	0.605	3%

Table 19.3.3 Deemed Annual Hot Water Use by Building Type (Ref. 5)

Building Type	Facility Days
Large Office	250
Fast Food Restaurant	365
Sit-Down Restaurant	365
Grocery Store	365
Elementary School	200
Jr/Sr High School or College	200
Healthcare	365
Hotel	365
Other Commercial	250
Average	**303**

Table 19.4.3 Incremental Cost and Lifetime

	Lifetime in Years	Incremental Cost
Kitchen Aerator	9	$8.00
Restroom Aerator	9	$8.00
Pre-Rinse Sprayer	5	$45.00

References:

1. 2008 Database for Energy-Efficient Resources, EUL/RUL (Effective/Remaining Useful Life) Values. http://www.deeresources.com/deer2008exante/downloads/DEER%200607%20Measure%20Update%20Report.pdf. Accessed on 7/31/12.

2. Franklin Energy Services, LLC Engineering Estimate (10 min) and US Department of Energy. Federal Energy Management Program. Energy Cost Calculator for Faucets and Showerheads. Typical use for commercial aerator = 30min. http://www1.eere.energy.gov/fem

3. Franklin Energy Services, LLC Engineering Estimate (10 min) and US Department of Energy. Federal Energy Management Program. Energy Cost Calculator for Faucets and Showerheads. Typical use for commercial aerator = 30min. http://www1.eere.energy.gov/fem

4. Efficiency Vermont Technical Reference User Manual, 2/19/2010.

5. US DOE Building America Program. Building America Analysis Spreadsheet, Standard Benchmark DHW Schedules http://www1.eere.energy.gov/buildings/building_america/analysis_spreadsheets.html

6. State of Illinois Energy Efficiency Technical Reference Manual, Page 131. July 18, 2012.

7. State of Illinois Energy Efficiency Technical Reference Manual, Pages 60-63 & Pages 90-97. February 8th, 2017.

8. IMPACT AND PROCESS EVALUATION FINAL REPORT for CALIFORNIA URBAN WATER CONSERVATION COUNCIL 2004-5 PRE-RINSE SPRAY VALVE INSTALLATION PROGRAM (PHASE 2)

9. Title 10, Code of Federal Regulations, Part 431 - Energy Efficiency Program for Certain Commercial and Industrial Equipment, Subpart O - Commercial Prerinse Spray Valves. January 1, 2010.

10. Data from Table 2 in Technology Data Characterizing Water Heating in Commercial Buildings: Application to End-Use Forecasting, Osman Sezgen and Jonathan G. Koomey, Lawrence Berkeley National Laboratory, December 1995.

11. Water and sewer rates from https://www.stpaul.gov/sites/default/files/Media%20Root/Water%20Services/SPRWS_2020_SaintPaulRates.pdf

12. United States Department of Energy. DHW Event Schedule Generator. (365 day average water main temperature for Minneapolis-St Paul Intl AP, MN). http://energy.gov/eere/buildings/downloads/dhw-event-schedule-generator

Changes from Recent Filing:

Water Rate update

General Inputs for the 2021-2023 Gas CIP BENCOST Model

Description
The margins, rates and "costs included in rates" used in the General Inputs of the Gas CIP BENCOST model were approved as part of Xcel Energy's most recent gas rate case (Docket No. G002/GR-09-1153) and went into effect in May 2011. The Company has updated these rates according to the guidelines provided in the Department of Commerce decision filled on February 11, 2020 (Docket No. G999/CIP-18-782)

BENCOST Input 1 (Retail Rate)

The Retail Rate represents the sum of the Company's currently approved tariff rate for each customer class, the Commodity Cost of $4.27 per Dth and a Demand Cost for firm non-demand billed customers of $0.95 per Dth. This value does not include the annual true-up adjustment, the annual CIP Adjustment Factor, or any other riders.

Retail Rate ($/Dth)

Customer Class	Tariff Rate	Commodity Cost	Demand Cost	BENCOST Retail Rate
Residential	$1.86/Dth	$3.25/Dth	$0.95/Dth	$6.06/Dth
Small Commercial Firm	$1.23/Dth	$3.25/Dth	$0.95/Dth	$5.43/Dth
Large Commercial Firm	$1.23/Dth	$3.25/Dth	$0.95/Dth	$5.43/Dth
Small Commercial Demand Billed[1]	$1.16/Dth	$3.25/Dth	$0.49/Dth	$4.90/Dth
Large Commercial Demand Billed[1]	$1.24/Dth	$3.25/Dth	$0.54/Dth	$5.03/Dth
Small Interruptible	$0.96/Dth	$3.25/Dth	N/A	$4.21/Dth
Medium Interruptible	$0.48/Dth	$3.25/Dth	N/A	$3.73/Dth
Large Interruptible	$0.43/Dth	$3.25/Dth	N/A	$3.68/Dth

The rate for Small Commercial Firm / Large Commercial Firm of $5.43/Dth was applied to all Business programs as it is expected that the vast majority of participants would be from these customer classes.

Annual Escalation Rate
The Annual Escalation Rate of 4.69 percent was provided in the DOC decision filing. This value was calculated using the average percentage change in the price of natural gas between 2018 through 2022 to all users in the West North Central Region as estimated in the Energy Information Administration's December 2018 *Annual Energy Outlook*.

BENCOST Input 2 (Non-Gas Fuel Retail Rate)

The Non-Gas Fuel Retail Rate represents the non-gas (normally electricity) retail rate paid by a customer or customer class. This value would be used to account for electric savings associated with gas conservation programs. Because the Company has separate electric conservation programs, we

[1] The Demand Billed classes' rates include both the commodity and demand components of their rates. The demand portion was calculated by dividing annual demand revenue by commodity sales.

did not include any electric benefits in the BENCOST model. Therefore, the Non-Gas Fuel Retail Rate is zero for all of our analyses.

BENCOST Input 3 (Commodity Cost)

The Commodity Cost, $3.25 per Dth, was provided in the DOC decision filing. This value is the weighted average of CenterPoint Energy, Great Plains Gas, Greater Minnesota Gas, Minnesota Energy Resources Corporation, and Xcel Energy's purchased gas adjustments (i.e. weighted average cost of gas) from January 2017 through December 2018, weighted by each utility's gas sales to non-exempt customers. The Commodity Cost input is also multiplied by the Annual Escalation Rate of 4.69 percent, which is described above in Input No. 1.

BENCOST Input 4 (Demand Cost)

The Demand Cost equals the Minnesota Total Demand (line 1) divided by the MN State Design Day (line 4) in Schedule A, Page 3 of the Company's March 1, 2019 Derivation of Current PGA Costs. Interruptible customers do not have demand costs. The Demand Cost is multiplied by the Annual Escalation Rate of 4.69 percent discussed in Input 1 above. The resulting 2019 demand cost of $78.67 was escalated one year at 4.69 percent to get a final 2020 BENCOST input value of $82.36.

BENCOST Input 5 (Peak Reduction Factor)

The Peak Reduction Conversion Factor, 1 percent, was provided in the DOC decision filing. This value represents an estimate of the percent of energy savings occurring on system peak.

BENCOST Input 6 (Variable O&M)

The Variable O&M input, is the Company's estimate of its variable Operations and Maintenance (O&M) costs, and is generally equal to its minimum transportation flexible rate for the Large Firm Transportation class. This Variable O&M input is multiplied by the Annual Escalation Rate of 4.69 percent discussed in Input 1 above. The resulting 2019 Variable O&M of $0.0392/Dth was escalated one year at 4.69 percent to get a final 2020 BENCOST input value of $0.0411.

BENCOST Input 7 (Non-Gas Fuel Cost)

The Non-Gas Fuel Cost represents the added or avoided costs of non-natural gas fuel associated with the Conservation Improvement Program. Because the Company has separate electric conservation programs that include electric benefits, we did not include any electric benefits in the BENCOST model. Therefore, the Non-Gas Fuel Cost is zero for all of our analyses.

BENCOST Input 8 (Non-Gas Fuel Loss Factor)

The Non-Gas Fuel Loss Factor represents the transmission and distribution line losses associated with non-natural gas (electric) fuels associated with the Conservation Improvement Program. Because the Company has separate electric conservation programs that include the electric benefits, we did not include any electric benefits in the BENCOST model and no loss factor was needed. Therefore, the Non-Gas Fuel Loss Factor is zero for all of our analyses.

BENCOST Input 9 (Gas Environmental Damage Factor)

The Environmental Damage Factor, $2.07 per Dth saved, was provided in the DOC decision filing. This value represents the long-term "external" cost to society and the environment of burning

natural gas. The factor is calculated using the median range of the final metropolitan fring environmental cost values approved by the Minnesota Public Utilities Commission (January 3, 2019 Order Updating Environmental Cost Values, Docket No. E-999/CI-14-643). It includes the costs of emissions (CO_2, SO_2, $PM_{2.5}$, CO, NO_X, and Pb). It also includes the estimated natural gas emission factor (or factors) for each emission provided by the Environmental Protection Agency (AP-42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources), For CO_2, Staff used a median value of $25.76/ton in 2020 from the Commission's January 3, 2018 Order Updating Environmental Cost Values. The Gas Environmental Damage Factor is multiplied by an Annual Escalation Rate of 2.30 percent as presented in the DOC decision filing.

BENCOST Input 10 (Non-Gas Fuel Environmental Damage Factor)

The Non-Gas Fuel Environmental Damage Factor represents the cost to society and the environment for generating electricity. Because the Company has separate electric conservation programs which include the cost to society and the environment for generating electricity, we did not include this cost in the BENCOST model. Therefore, the Non-Gas Fuel Environmental Damage Factor is zero for all of our analyses.

BENCOST Input 11 (Participant Discount Rate)

The Participant Discount Rate for business customers is represented by the utility's after-tax weighted cost of capital as approved in the utility's most recent rate case, or 6.38 percent. For residential customers, it is represented by the Societal Discount Rate, discussed in Input 13.

BENCOST Input 12 (MN CIP Utility Discount Rate)

The CIP Utility Discount Rate is used in the Utility Cost Test to value, in current dollars, the future stream of utility sustem benefits and costs (excluding benefits resulting from avoided environmental data as discussed avobove in Input 9) resulting from a conservation investment. The MN CIP Utlity Discount Rate of 5.34 percent is approved for analysis of the Company's gas CIP programs, as approved in the *Deputy Commissioner's Decision – In the Matter of CIP Gas and Electric Utilities 2021-2023 Cost-Effectiveness Review*. February 11, 2020. Docket Nos. G999/CIP-18-782, E999/CIP-18-783.

BENCOST Input 13 (Societal Discount Rate)

The Social Discount Rate, 3.02 percent, was provided in the DOC decision filing.

BENCOST Input 14 (General Input Data Year)

The General Input Data Year for the 2021-2023 CIP Triennial Plan, 2020, was provided in the DOC decision filing.

BENCOST Input 15, 15a, and 15b (Project Analysis Years 1, 2, and 3)

The Project Analysis Years are the years over which the Company's CIP Triennial Plan will be effective, 2021, 2022, and 2023, respectively.

Budget Categories

Description
The following chart indicates which expenses are attributed to each CIP budget category in this filing.

Budget Category	Components
Customer Services	• Consulting costs for customer scoping and project management, subsidies for assessments and engineering studies. • Costs to purchase EE equipment and to install efficient equipment at the customer site.
Project Administration	• Project planning, development and implementation. Marketing and support staff including program managers, marketing assistants, developers, technical support staff, rebate processing, sales and call center representatives, inside contract labor, and other fulfillment associated with delivering a product directly to the customer. • Auditors, installation contractors, vendors, technical consultants, fulfillment contractors and alternative providers that Xcel Energy contracts with to provide DSM services. • Equipment purchase costs and repair; hardware and software; supplies; and other employee expenses.
Advertising & Promotion	• TV, radio, newspaper and print media; direct promotion and sales support materials; postage, promotional events; contracted outbound telephone sales. • Customer education through seminars, pamphlets, videos and computer games. • Communication staff and other supporting labor.
Measurement & Verification (M&V)	Program evaluation expenses and consultants performing M&V.
Rebates	Customer rebates and incentives given in the form of subsidized products or equipment.
Other	• Vendor and trade incentives. • Direct and indirect regulatory fees.

Electric Cost-Benefit Analysis Key

2021/2022/2023 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test $/kW	Utility Test $/kW	Rate Impact Test $/kW	Total Resource Test $/kW	Societal Test $/kW
Benefits					
Avoided Revenue Requirements					
Generation	N/A	A1	A1	A1	A1
T & D	N/A	A2	A2	A2	A2
Marginal Energy	N/A	A3	A3	A3	A3
Environmental Externality	N/A	N/A	N/A	N/A	A4
Subtotal	N/A	A	A	A	A
Participant Benefits					
Bill Reduction - Electric	B1	N/A	N/A	N/A	N/A
Rebates from Xcel Energy	B2	N/A	N/A	B2	B2
Incremental Capital Savings	B3	N/A	N/A	B3	B3
Incremental O&M Savings	B4	N/A	N/A	B5	B5
Subtotal	B	N/A	N/A	B	B
Total Benefits	C	C	C	C	C
Costs					
Utility Project Costs					
Customer Services	N/A	D1	D1	D1	D1
Project Administration	N/A	D2	D2	D2	D2
Advertising & Promotion	N/A	D3	D3	D3	D3
Measurement & Verification	N/A	D4	D4	D4	D4
Rebates	N/A	D5	D5	D5	D5
Other	N/A	D6	D6	D6	D6
Subtotal	N/A	D	D	D	D
Utility Revenue Reduction					
Revenue Reduction - Electric	N/A	N/A	E1	N/A	N/A
Subtotal	N/A	N/A	E	N/A	N/A
Participant Costs					
Incremental Capital Costs	F1	N/A	N/A	F2	F2
Incremental O&M Costs	F3	N/A	N/A	F4	F4
Subtotal	F	N/A	N/A	F	F
Total Costs	G	G	G	G	G
Net Benefit (Cost)	H	H	H	H	H
Benefit/Cost Ratio	I	I	I	I	I

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

Explanation of Inputs

N/A = Not applicable
A1 = Generation Avoided
A2 = Transmission and Distribution Avoided
A3 = Marginal Energy Reduced
A4 = Environmental Factors (Emissions) Avoided
A = Total Avoided Revenue Requirements
B1 = Reduced Electric Revenues from Project
B2 = Rebate paid by Xcel Energy
B3 = Incremental Capital Savings
B4 = Incremental Participant Non-Energy O&M Savings plus Natural Gas Savings
B5 = Incremental Participant Non-Energy O&M Savings * Electric Share of Avoided Revenue Requirements
B = Total Benefits realized by Participant
C = Total Benefits = A + B
D1 = Customer Services Costs
D2 = Project Administration Costs
D3 = Advertising & Promotion Costs
D4 = Measurement & Verification Costs
D5 = Rebate Costs
D6 = Other Costs
D = Xcel Energy's Total Project Costs
E1 = Reduced Electric Revenues from Project = B1
E = Total Reduced Electric Revenues from Project
F1 = Incremental Participant Capital Investment before Rebate
F2 = Incremental Participant Capital Investment before Rebate * Electric Share of Avoided Revenue Requirements
F3 = Incremental Participant Non-Energy O&M Costs plus Natural Gas Costs
F4 = Incremental Participant Non-Energy O&M Costs * Electric Share of Avoided Revenue Requirements
F = Total Costs realized by Participant
G = Total Costs = D + E + F
H = Net Benefit or Cost = C - G
I = Benefit / Cost Ratio = C / G

General Assumptions

CIP Utility Discount Rate = 5.38% (Applicable to costs and benefits in Participant, Utility, Rate Impact and Total Resource Tests)
Societal Discount Rate = 3.02% (Applicable to costs and benefits in Societal Test)
Transmission and Distribution Avoided Costs = $10.59/kW-year in 2021, escalated by 2.36%
Generation Avoided Capacity Costs = $60.87/kW-year in 2021, escalated by 2.00%
Environmental Externality = Varies in $/MWh annually. Based on Resource Planning Modelling of 1 MW of Energy Avoidance for every hour in the future using Preferred Plan in Company's Upper Midwest Energy Plan filed July 1, 2019.